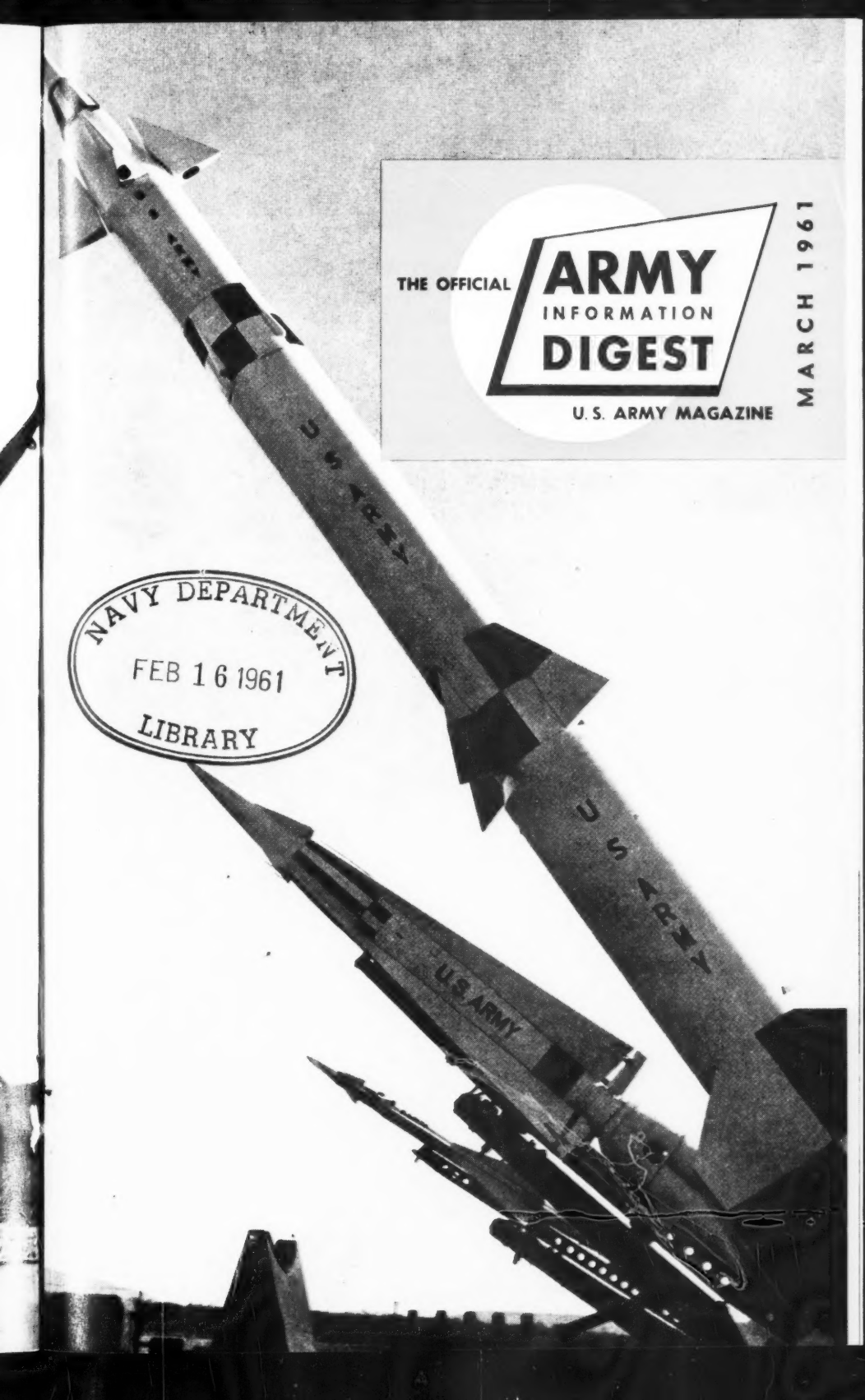

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U. S. ARMY MAGAZINE

MARCH 1961

ARMY
INFORMATION
DIGEST

THE OFFICIAL MAGAZINE OF
THE DEPARTMENT OF THE ARMY

The mission of ARMY INFORMATION DIGEST is to keep personnel of the Army aware of trends and developments of professional concern.

The Digest is published under supervision of the Army Chief of Information to provide timely and authoritative information on policies, plans, operations, and technical developments of the Department of the Army to the Active Army, Army National Guard, and Army Reserve. It also serves as a vehicle for timely expression of the views of the Secretary of the Army and the Chief of Staff and assists in the achievement of information objectives of the Army.

Manuscripts on subjects of general interest to Army personnel are invited. ***Direct communication is authorized to: Editor, Army Information Digest, Cameron Station, Alexandria, Va.***

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COVER: Three generations of Nike progeny—Ajax, Hercules, Zeus—are here arrayed for a family portrait. Progress in Army missilery—in production, training, air defense, and ground operations—is the subject of special coverage in this issue.

COMMAND LINE

Army Views On Vital Issues

ON THE ARMY'S ROLE

"The Army believes that the strategic problem of the United States as leader of the Free World coalition in these turbulent times is immensely complex. We believe that there is no neat or parochial solution to this problem. We cannot have an exclusively "maritime" or "aerospace" or "land-mass" approach to strategy. The Army believes that the strategic solution must be a flexible, pragmatic combination of all these three, considered in context with political, economic, and other non-military factors that further complicate the formulation of strategy.

"To carry this theme further, the Army believes that the land, sea, and air components of national military power are interdependent elements to be applied under unified command and direction toward attainment of the objectives of the United States. Each element is indispensable; all are complementary; together, they form an integrated team.

"The Army believes that, although land, sea, and air forces are complementary, land forces possess a distinctive capability. This capability is to defeat enemy forces in land combat and gain control of the land and its people.

"Our doctrine takes into account the fact that the land, unlike the relatively homogeneous sea and air, is a medium of infinite variety. Its nature is complicated by variations in terrain, by vegetation, by man-made structures. Within this complex medium, individual soldiers must live, move, communicate, and fight as teams. We have learned that the problems of land combat, therefore, are not susceptible to formulae, simple dogmas, slogans—or even rules of thumb.

"Hence, our philosophy and doctrine must be pragmatic and flexible. Army planning by its nature must be detailed, and provide for various contingencies. We must exhibit a flexibility, a resilience, and an adaptiveness to cope with the shifting tactics of an enemy, always quick to probe any chink in our armor. Similarly, Army tactics and organization cannot be evaluated by mathematical methods alone. Always they must be evaluated in light of the wide experience which the Army has gained in the art of warfare in the land environment."

General George H. Decker, Army Chief of Staff,
at Command and General Staff College,
Fort Leavenworth, Kansas, 16 December 1960.

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Instantaneous, electronic, supersonic, air defense devices enable Army missilemen to cope with today's and tomorrow's expected targets as

MISSILES MEET

THEIR MASTER

Lieutenant Colonel C. P. Rountree

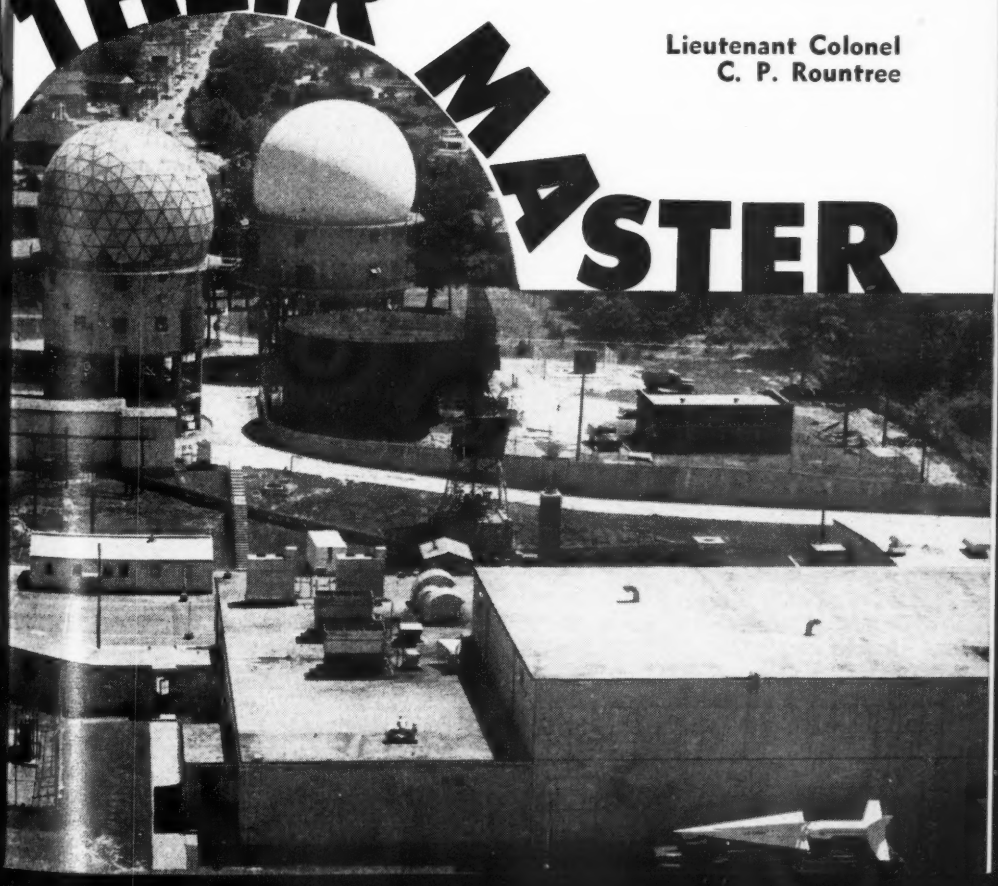
THE operations officer in the "Blue Room" was routinely watching his busy radar scope and occasionally chatting with the other crew members when the alert came. The signal was definite—a target approaching at a speed faster than sound. Long-range warning had alerted the defense; word was passed to the firing units, and in a matter of seconds, sleek white Nike missiles were pointing skyward, ready for launching.

The target turned toward the defended area. As it came within missile range, the fire unit tactical control officer pushed the "fire button." "Five, four, three, two, one, BURST." The light yellow spot vanished from the radar scope, signifying "mission accomplished"—target destroyed.

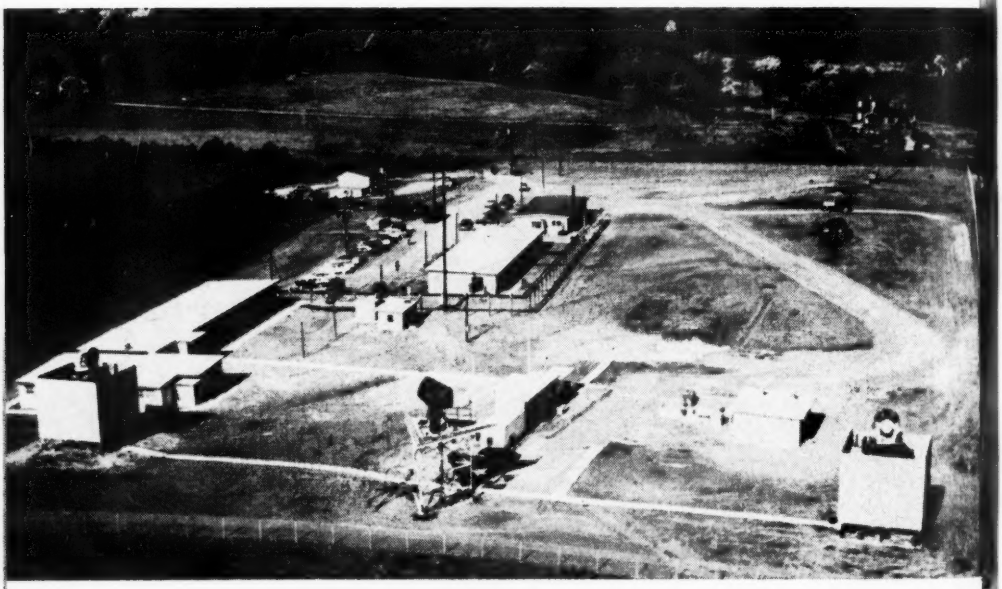
Actually, all but the firing of the missile took place, for this was a training exercise designed to test the ability and skill of today's missilemen and train them for the possible. But if the need ever arises, missiles with tremendous destructive power will be launched to strike down enemy targets far out, before they can inflict damage.

This entire exchange of information took place without a word spoken—for all data was transmitted instantaneously and electronically. Advances in modern radar and weaponry today make it possible to knit together all

LIEUTENANT COLONEL C. P. ROUNTREE, Artillery, is Operations and Training Officer, 35th Artillery Brigade, Fort George G. Meade, Maryland.



In aerial view of a typical Nike installation, radars of the fire control platoon are seen below, with launchers and missiles standing ready in background, above,



of the many elements that make up a modern defense complex. Only two decades ago—during World War II—air defense was a slow, word-of-mouth, predicted gun fire type of operation, directed against relatively slow aircraft and low-altitude air-breathing guided missiles that followed a preset non-maneuvering course. Such an air defense system would be ineffective against the latest type of supersonic aircraft and missiles of today.

To keep pace with ever-changing offensive weapons, the surface-to-air missile with tremendous speed, guidance ability, and great destructive power was designed, and action to

produce an electronic control system was initiated. Only seconds are available to pass on to the missile commander information upon which he can effectively engage a supersonic aerial target. Thus came into being the "Missile Master"—a complex electronic system to provide the commander with instantaneous intelligence upon which to base his decisions and react promptly and properly. It permits full exploitation of the capabilities of supersonic maneuverable, guided missiles.

The Weapons

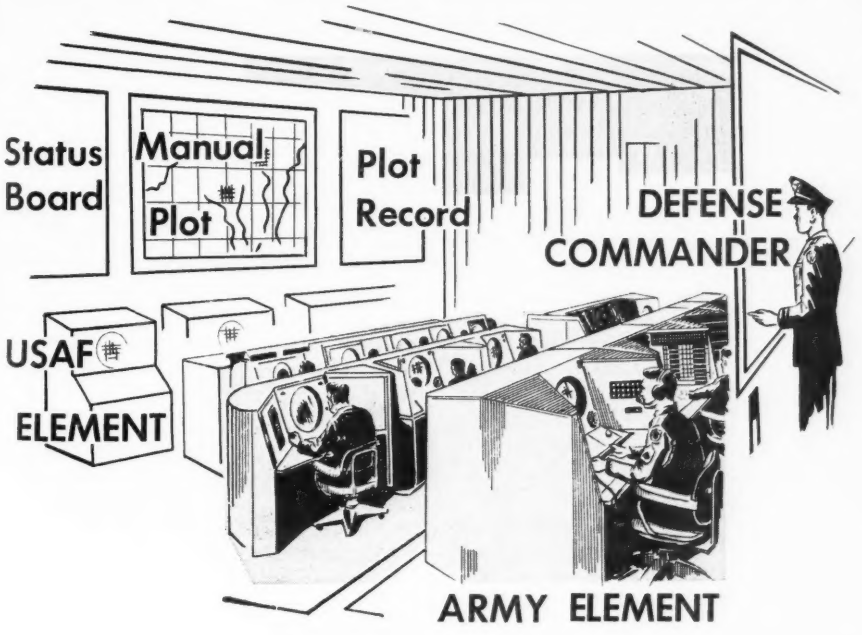
AS early as 1944 the U.S. Army began outlining its requirements for an air defense aerial vehicle that could be guided during flight and cope with high-speed, high-altitude, highly maneuverable targets—targets that the conventional antiaircraft artillery gun could not engage effectively. This intense program led to the development of the Nike-Ajax missile system. Its deployment in 1953 around Washington and Baltimore marked the Free World's first operational surface-to-air guided missile.

The Nike-Ajax is a two-stage, supersonic missile that carries several high explosive lethal warheads. Because of its speed, range, altitude, and maneuverability, it can destroy enemy targets regardless of evasive action and can meet an attack from any direction. These missiles have been deployed throughout the Continental United States.

The Nike system consists of two parts—the missile with its associated launching equipment, and the control equipment made up of radars and computers. It is an ever-alert system, instantly ready around the clock. It has served the country and its people well.

The second generation of the Nike family—the Nike-Hercules—now in being can launch either an atomic or

Interior of the 35th Brigade's Army Air Defense Command Post demonstrates how various elements and facilities blend to provide control of a defense complex.



non-atomic warhead to combat hostile targets which are beyond the effective range of the Ajax. The Ajax missile not only serves as a backup, but increases the volume of fire.

When equipped with an atomic warhead, the Hercules has the capability of destroying entire formations of enemy aircraft far out from the intended target area. Besides being much faster than the Ajax, its much greater range enables it to take advantage of the new range capabilities of radar and it provides added capabilities at higher and lower altitudes.

As early as 1959, the Nike-Hercules successfully engaged the supersonic XQ-5 target drone. This occasion marked the first time that any air defense missile had destroyed a target moving at more than 1,500 miles per hour and at more than 12 miles altitude. Since then, great strides have been made in target engagement capability and technique.

The Missile Master

THE first Missile Master for the Army Air Defense Command was delivered to the 35th Artillery Brigade at Fort George G. Meade, Maryland. A prototype model of others to follow, it became operational in the Washington-Baltimore defense in late 1957. Known technically as the AN/FGS-1 system, it has since undergone many changes and modification improvements, and can boast that it has provided continuous operation without failure since it began functioning in 1957.

This Missile Master was the first of ten similar systems to follow. The second was put into operation in early 1960 at Fort Lawton, Washington. Other systems have been installed at Philadelphia, New York, Boston, Buffalo-Niagara, Pittsburgh, Detroit, Chicago, and Los Angeles.

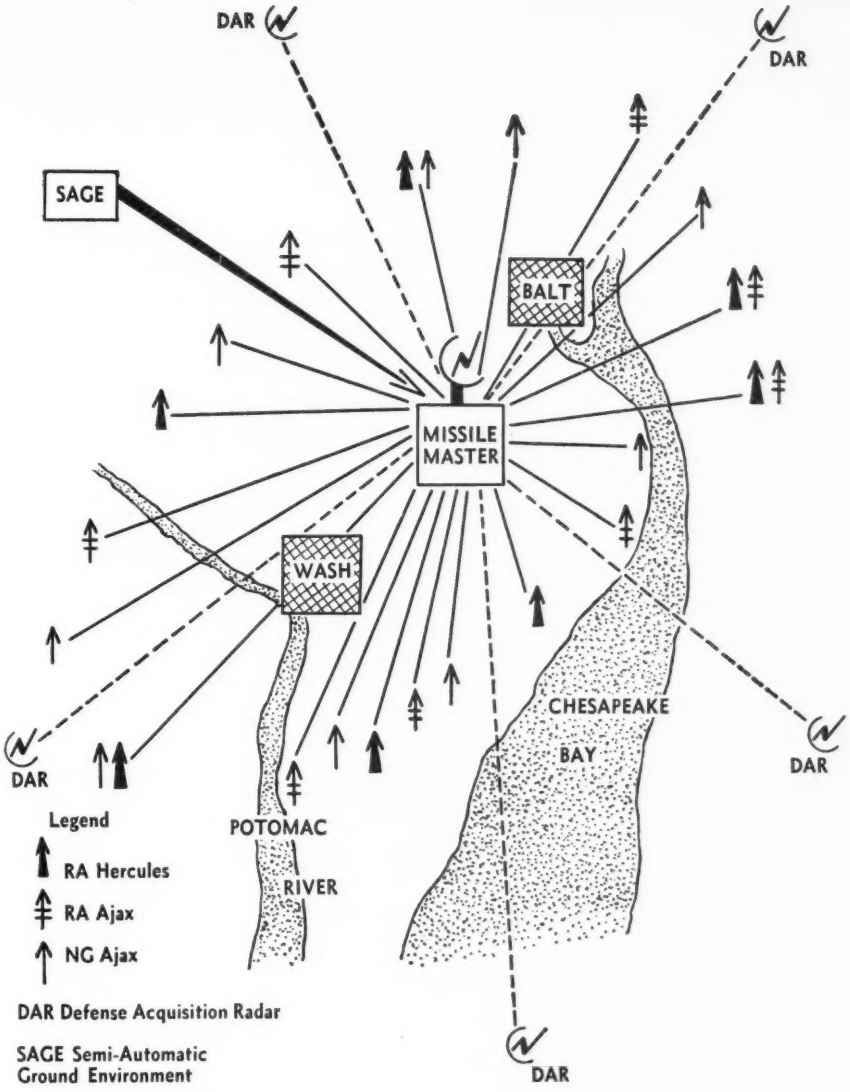
The 35th Artillery Brigade's Missile Master is part of the Army's contribution to the North American Air Defense Command (NORAD), which is a joint US-Canadian command with the mission of providing air defense of the North American Continent.

The Missile Master is used to control and distribute the fires of Nike-Ajax and Hercules missile batteries, discriminating between friendly and unfriendly targets with the speed and accuracy made possible by the wonders of electronics.

The "heart" of the Missile Master is the Operations or "Blue Room," so-called because of the "easy eye" blue lighting. Technically known as the Army Air Defense Command Post (AADCP), it functions as a separate major staff section, reporting directly to the brigade commander and executive. Because of the closeness of its mission to the entire defense, coordination is effected daily with the Operations and Training Section, where overall defense programs are directed.

Within the "Blue Room" are such facilities as operations consoles, tactical monitor equipment, tracker consoles, plotting boards, status boards and a room where the defense commander can monitor and direct the entire defense air battle. Integral parts of the Missile Master are the long-range radars (AN/FPS-33 or AN/FPS-20) and height finder radars (the AN/FPS-6s). With data coming from these radars and that furnished by SAGE (Semi-Automatic Ground Environment), the Missile Master can pass instantaneously to the missile battery commander the very latest intelligence upon which to base his decisions.

The Missile Master Fire Unit Integration Facility ties the Army Air Defense Command Post to the battery. By this electronic means, such information as location of targets, identity, speed, altitude, and engagement status can be passed directly to the radar scope of the battery. With missiles ready and pointed skyward, it is only a matter of seconds until one can be on its way to stop the intruder long before he reaches his objective.



Overall complex is combination of radars, missiles and communications.

Tactical SOP

IN a typical engagement by the battery, detection normally comes from an Army Air Defense Command Post such as Missile Master and is relayed electronically to the fire unit in the form of early warning target data and identification. This information appears as a symbol on the acquisition radar scope. The acquisition radar continuously scans throughout 360 degrees and any target in its path is displayed as a dot of light on the scope. Targets on the scope are identified by symbols sent by the Missile Master or by the SAGE system, and the battery commander selects the target that presents the greatest threat.

Missiles Meet Their Master

Once the target has been selected, the attack begins as the systems target radar tracks the enemy vehicle—for the radar now sends position information to the electronic computer. In the meantime, a similar missile-tracking radar has been "locked" on an Ajax or Hercules in the launching area, and it, too, is furnishing missile position data to the computer.

The computer compares target and missile positions continuously and computes an optimum kill point in front of the enemy target. All of the data is instantaneously and continuously displayed on plotting boards and dials to provide the Battery Commander with visual second-to-second intelligence.

Destruction of the target begins when the missile is launched. It is boosted to supersonic speed by solid propellants; thereafter, speed is maintained by a sustainer motor within the missile. During this entire process the missile tracking radar has been automatically tracking the missile and sending steering orders to guide it to the kill point solved by the computer. This action continues until the missile and the target are within a fraction of a second of physically colliding.

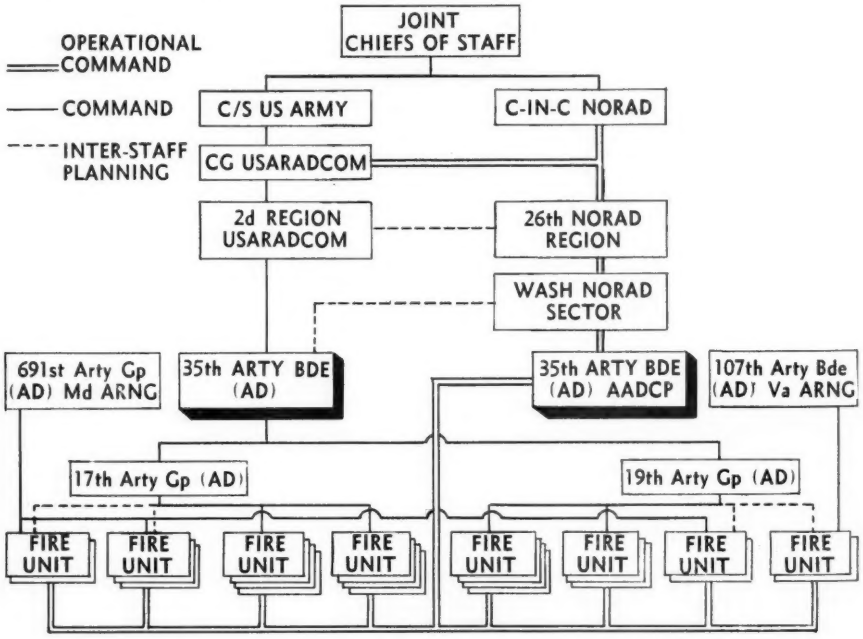
The computer then sends a burst command to the missile, detonating the warhead containing thousands of steel fragments which engulf and destroy the target. This process of engagement of new targets can be repeated immediately.

Brigade Operation

IT IS NOW customary to refer to the Nation's missile defenses as "conventional," for Army air defense today has virtually no weapons of the gun type. In this respect, we are truly in the missile era.

The 35th Artillery Brigade (Air Defense) is typical of the type of organization found throughout the United States today. A component of the U.S. Army Air Defense Com-

COMMAND CONTROL STRUCTURE—WASHINGTON-BALTIMORE



mand, it has the mission of providing the air defense of Washington-Baltimore, in the Nation's Capital area.

Under the Army Air Defense Command, Nike units of the Washington-Baltimore complex are grouped into a Brigade Defense Command. Organized under the Brigade are two Active Army Groups and eight Active Army and National Guard Battalions; under the Battalions are twenty-four fire units. (*See chart, opposite.*)

The Washington-Baltimore missile defense goes back to late 1953 when the metropolitan area was being defended by conventional heavy antiaircraft artillery guns. In that year the Nike batteries equipped with the sleek white Ajax missile began deployment at optimum locations throughout the rolling hills of Northern Maryland and Upper Virginia.

In late 1957 the Missile Master facility was installed to replace a manual operations center at the 35th Artillery Brigade. This Missile Master, with its 24 missile fire units, guards an area of more than 40,000 square miles, overlapping the Philadelphia Missile Defense to the north, the Norfolk Defense to the south, and extending far inland and out over the Atlantic Ocean.

The Missile Master has the ability to exchange information with nearby defenses as well as send and receive early warning and identification from the Air Force's Semi-Automatic Ground Environment (SAGE) system for the overall coordination of the air battle. It apportions the fires throughout the defense, acts to prevent duplication of fire, and enables the missile unit commander to attain the maximum effect from his weapons.

INTEGRAL to the Missile Master itself are the Defense Acquisition Radars. These radar sites are equipped with the long range AN/FPS-36 radar, and in addition to extending the radar "eyes" for the defense they serve as "gap fillers" for the entire sector. The site itself has the necessary housing, messing, and equipment facilities for continuous operation.

Data acquired by these radars are sent directly to the Operations Room at the Missile Master where it provides acquisition data for the fire units, supplements intelligence coming from SAGE, and is a big factor in the correlation of target information.

Defense acquisition radar sites are in most cases located in somewhat isolated areas, selected to provide the best radar coverage. Each radar section consists of a Section Chief and 13 enlisted assistants who are charged with an efficient and effective operation on a 24-hour basis. An aggressive training program is conducted under the close supervision of the Brigade Radar Officer.

Enter Hercules

THE Nike-Ajax missile had been keeping its vigilance throughout the United States for only about four years when the Nike family produced the bigger Hercules. Nike-Hercules batteries began replacing Ajax units in 1958 and now provide a formidable defense within themselves. The many weapons, radars, and other equipments tie together to create a watertight defense.

Nike-Hercules batteries have been provided an additional longer range acquisition radar, referred to as the alternate battery acquisition radar—the AN/FPS-36 which has been tied into the overall Nike system. Developments are well under way to refine and further extend range and detection capabilities. These are all designed to improve the entire system and take full advantage of the range and altitude capability of Hercules.

National Guard Role

IN furtherance of the "One-Army" concept, the Army National Guard has taken over part of the Active Army's Nike-Ajax fire units. This conversion began with an intensive

training program on-site and at the Army Air Defense School at Fort Bliss, Texas. Active Army Battalions conducted formal pre-technical schooling for the National Guard cadres who were later to be school-trained to include an actual firing. This training helped speed the process of conversion from a group of generally untrained men, to a highly trained team capable of effectively launching the deadly Ajax missile.

The first National Guard batteries, coming from Virginia and Maryland Army National Guard organizations, went on site in the Washington-Baltimore defense in September 1959. Additional sites have been turned over since that time, and now the Guard occupies nine Nike-Ajax missile systems surrounding the metropolitan area. In two instances the Guard jointly occupies a double site with the Active Army.

Each of these National Guard systems are manned by forty-eight persons, who live in the local community near the site. Their tactical mission is the same as the Active Army.

NORAD Control Center

THE North American Air Defense Command—of which the 35th Artillery Brigade (Air Defense) is a part—encompasses many areas and functions. The Air Defense concept includes a flexibility of organization and operation, necessary to insure continuous operations and effective engagement of an enemy attacking force. In the so called "normal" mode operation, the Brigade's AADCP is in communication and operation with a NORAD SAGE system. Basic data coming from SAGE includes early warning intelligence, identification, and engagement instructions.

To operate continuously and effectively without SAGE, the Washington NORAD Control Center (NCC) was established in March 1960 at Fort George G. Meade, Maryland, with the 35th Artillery Brigade Headquarters and Air Force Detachment 1 from the NORAD Sector as components. The Commanding General of the Brigade was designated the NCC Commander.

The NORAD Control Center's area of responsibility includes a vast portion of the east coast extending in certain cases from above Philadelphia on the north to below Norfolk on the south. When completely operational, the NCC will have the necessary equipment to scramble and control intercept aircraft as well as control the fire of ground-to-air missiles and other weapons.

Installation of the large AN/FPS-20 radar extends the range of the earlier installed AN/FPS-33 radar. The "Blue Room" will be jointly occupied by Army and Air Force personnel working together to achieve one end—denial and destruction of an intruding enemy in any part of this vast and important area of the Eastern Seaboard.

Should the 35th Brigade AADCP and the NORAD Control Center functions be disrupted, then the Missile Fire Units of the defense are prepared to operate autonomously under North American Air Defense Command regulations.

The Means

TO supervise and control such a widespread area, the 35th Artillery Brigade (Air Defense) and its units are organized on a functional basis, with tactical operations and training its prime and foremost purpose.

The Missile Master Section comprises 139 officers and enlisted personnel. An extremely active and continuous training program is conducted, to keep the already well-trained soldier in "peak" condition.

A U.S. Army Signal Support Detachment recently assumed full responsibility for support of the Missile Master installation, except for that equipment which is supported by Air Force attached elements. A small number of Martin Company represen-

tatives remain on-site as technical advisors.

The Air Force Detachment's mission is to support the NORAD Control Center. Under the direction of the NCC Commander, they have the necessary personnel and equipment to scramble and control aircraft—while the AADCP will simultaneously have the ability to control the fires of the missile batteries.

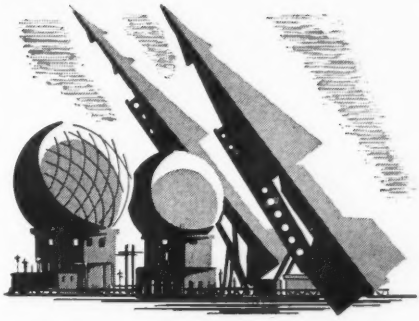
The effectiveness of the Brigade missile units could not be assured without occasional "live" firings by the soldiers who man these defense weapon. Annually, tactical crews of the Washington-Baltimore defense fly down to the White Sands Missile Range in New Mexico to prove that they can successfully engage the "enemy." High speed aerial drones simulate the most realistic targets and actual firings are conducted under alert and surprise type conditions.

Situations are provided requiring a Nike fire unit commander to make tactical decisions—thus training the commander and his troops to respond quickly and effectively. Although routine training on-site is thorough in every way, including simulated firings, nothing replaces "pushing the fire button" and watching the Nike missile roar into the sky and seek out its target. Training on-site culminates in keen competition during Annual Service Practice.

Units also participate in on-site tactical exercises. These range from locally controlled CPX-type exercises to participation in NORAD-wide large-scale problems. Each exercise provides information essential for overall analysis—a means by which the commander determines the best methods of operation with the weapons and facilities available.

The Defense

IN THIS AGE of fast-moving techniques of modern warfare, Nike-Missile batteries and the Missile Master team up with other branches and services to provide this Nation's Capital area with the latest and most effective defense possible against the targets of today. However, it is recognized that the weapons of today will not cope with all of tomorrow's targets.



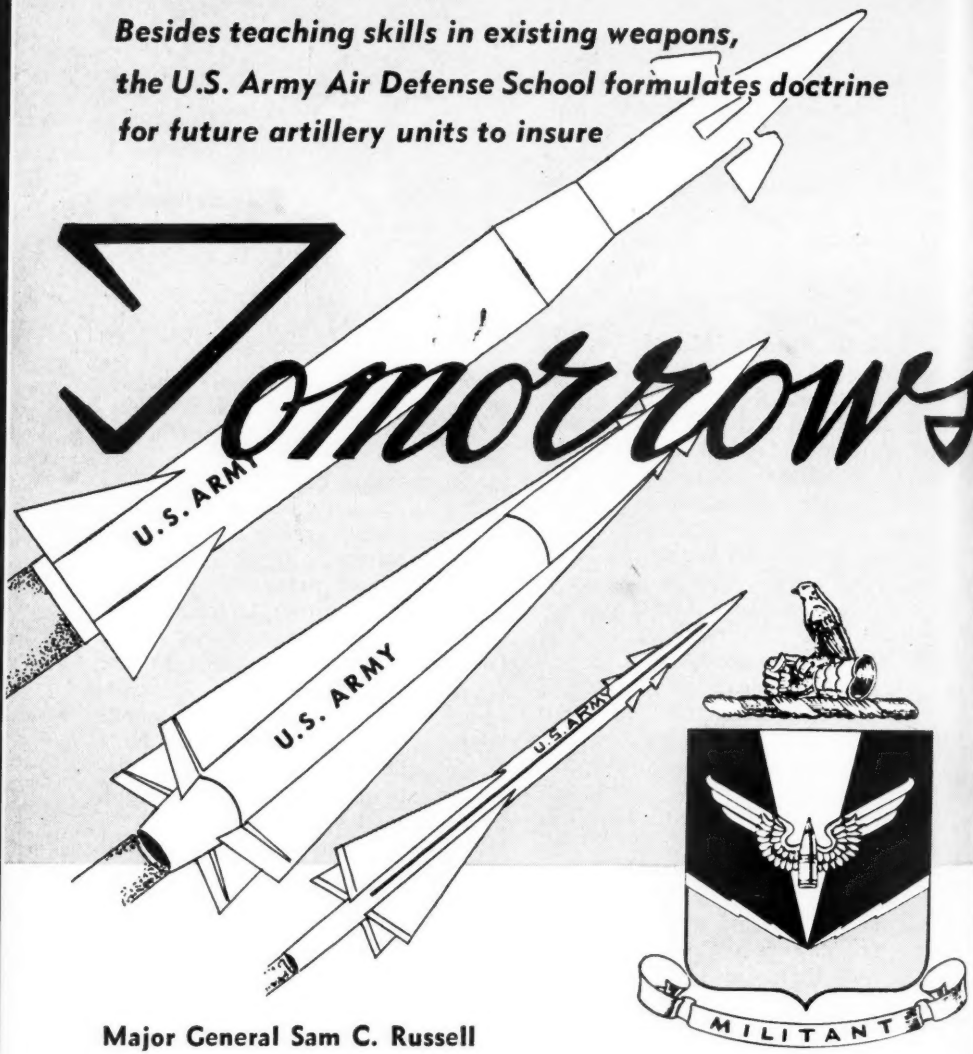
Missiles are now "conventional" defense.

The greatest current threat is the Intercontinental Ballistic Missile (ICBM) with its capability for transcontinental flight. The Army is counting on another generation of the Nike family—the Nike-Zeus, now under development—to counter the growing long range missile threat, and thus reinforce our continental air defense when the weapon becomes operational. Substantial progress has been made in all program areas, indicating that Zeus will have the same high reliability against the ballistic missile that Nike-Ajax and Hercules have enjoyed against air support targets. (See "Nike-Zeus—Our Developing Missile Killer," December 1960 DIGEST.)

Long-range early warning radars, defense acquisition radars, Nike-Ajax and Nike-Hercules missiles, Missile Master, and the soldiers of the 35th Artillery Brigade who man them, are joined as a team to make Nike missiles and their Master one of the best defenses guarding strategic centers within the continental United States. It is an organization dedicated to providing the best possible "sure-kill" defense—one that serves as a deterrent to any potential aggressor.

Besides teaching skills in existing weapons, the U.S. Army Air Defense School formulates doctrine for future artillery units to insure

Tomorrow's



Major General Sam C. Russell

CREWS that manned the first Nike-Ajax missiles were trained here. Crews now manning the second generation Nike-Hercules are training here. Crews that will man tomorrow's Nike-Zeus system will be trained here also. And so, too, will be those who operate the surface-to-air guided missile weapons systems of the more distant future —systems which will be developed partly within the doctrinal responsibility of the U.S. Army Air Defense (USARAD) School, Fort Bliss, Texas.

For it is the dual mission of this School to teach the skills needed to command, operate and maintain existing Army air defense units while at the same time studying and analyzing equipment operation to determine how air defense artillery units of the future should be organized and employed. The School takes action to secure approval for doctrinal concepts

Air Defense Today

it has developed, and then it teaches the approved doctrine.

Thus recommendations made at the school foreshadow to a large extent the type of weapons that Army air defense forces may have a decade from now. The School also seeks to develop techniques for training the officers and enlisted teams who will be manning those weapons.

To accomplish this dual mission, the Air Defense School is drawing on its record of experience in advancing the guided missile program of the United States since the late 1940s. It has successfully trained personnel, both United States and Allied, who man missile sites in all parts of the Free World. In the swiftly approaching future, the tried and proved Ajax and Hercules now guarding continental industrial sites and the Hawk units being placed under troop commanders for field army protection soon will be joined by other missile systems with fantastic kill capability against aircraft and ballistic missiles.

USARAD School

THE Air Defense School epitomizes the history of heavy weaponry, for it is a direct descendant of the Artillery Corps for Instruction—later the Coast Artillery School—which was founded in 1824 at Fortress Monroe, Virginia. It is thus the oldest U.S. military branch school now existent, and the largest school of its type in the Free World.

Back in those days, a weapon could be developed in four or five years and would remain effective for half a century or so. But today weapons require much longer to develop—and they become obsolete in a shorter period of

time. So as technological advances gain momentum, special emphasis must be placed on keeping abreast of weapon developments.

Here at the Air Defense School we are not content with keeping abreast. We must not merely remain in step but must look forward to the challenging problems of air, ballistic missile, and space defense.

Immediate predecessor to the Air Defense School was the Antiaircraft Artillery School which was activated at Camp Davis, North Carolina, in 1942. It moved to Fort Bliss two years later and was renamed the U.S. Army Air Defense School in 1957.*

At present the School has more than 1,500 resident students—both U.S. and Allied. Facilities and equipment include 400,000 square feet of laboratory space plus 124 50-man classrooms valued at more than $18,000,000 and containing equipment valued at more than $80,000,000. The military reservation of Fort Bliss, covering more than a million acres, allows firing ranges that extend 65 miles north into New Mexico.

Since 1953 the School has graduated more than 75,000 students. It has trained more than 20,000 technicians for more than 400 Nike missile batteries, first the Ajax and now the Hercules. In addition, training has been conducted on the Hawk (Homing All the Way Killer) missile that provides field armies with protection against low-flying manned aircraft.

Currently, the School is making extensive preparations to conduct instruction on the improved Nike-Hercules. This improved system will allow even greater capability against supersonic bombers and powerful jammers of the future. Courses began last November for maintenance technicians in the improved Hercules.

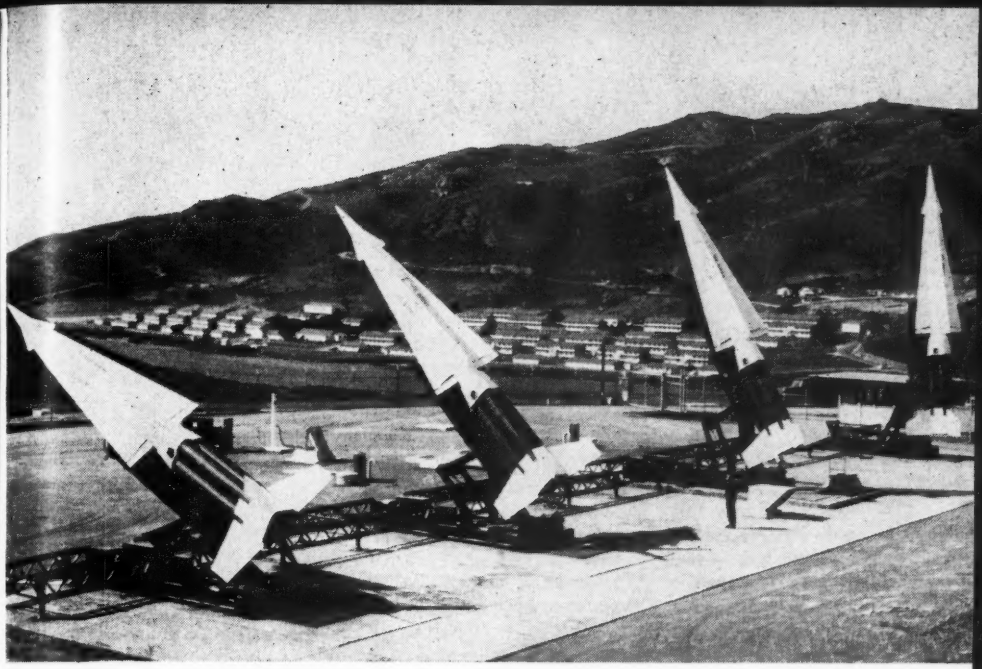
"Package" training of all the personnel required to man a battery was an innovation of USARAD School. Under this system, the officers and men needed to form a battery are assembled and their training scheduled so that an entire package graduates as a team, ready to take to the field. Course lengths thus vary from four to 42 weeks.

Students spend about half their time in the classroom; the remainder is devoted to practical training in the radar, computer and missile laboratories. Three categories of courses are conducted—technician, orientation, and supervisory.

Most instruction is of the technician variety, with courses designed to meet unit requirements for officer, warrant officer and enlisted technicians, and to provide technical instruction on Ajax, Hercules, Hawk,

*Major General Marshall Carter assumed duties as School Commandant and Commanding General of the Air Defense Center in February. Brigadier General Stephen M. Mellnik is Assistant Commandant of the School.

MAJOR GENERAL SAM C. RUSSELL, now Chief of Staff, Eighth U.S. Army, Korea, was Commanding General, U.S. Army Air Defense Center and Commandant, U.S. Army Air Defense School until December 1960.



As the Army puts Nike-Hercules batteries into operation, like this one at Fort Barry, California, School retrains Ajax personnel in Hercules operating techniques.

and other special purpose air defense equipment.

Technician Training

TECHNICIAN course content is not of a general utility nature, but is specifically applicable to certain jobs on various equipments. This shortens training time, and also assists in developing sound programs of instruction, based on detailed analyses of the tasks technicians must perform. The instruction is designed to produce the skills needed for effective performance of specific jobs.

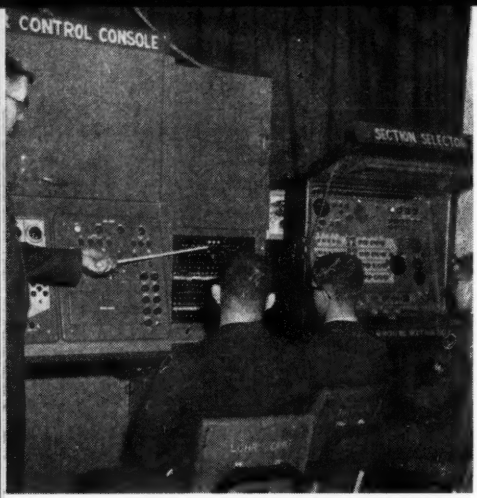
As the Army puts more and more Nike-Hercules batteries into operation, the School retrains Ajax personnel to perform similar duties with Hercules. Both systems require about the same number and types of technicians—three types of enlisted technicians (integrated fire control, missile electronics and missile mechanical) and one maintenance officer technician.

Instruction on Hawk varies in length from 24 to 40 weeks. Technicians are trained for specific fields such as radar, missile and launcher mechanics, staff and maintenance.

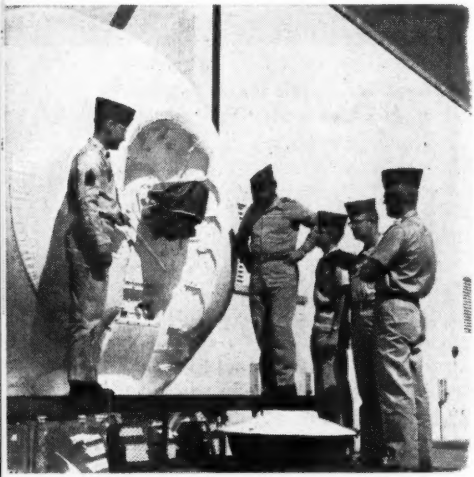
A considerable number of courses train the technicians required to operate and maintain various types of special purpose air defense accessory equipment. These include electronic warfare courses (defense acquisition radar, Ajax and Hercules fire control radars, and officers' electronic warfare orientation training) and courses on Radio Controlled Aerial Targets (RCAT); target simulator (MPQ-36); and fire distribution equipment (Battery Terminal Equipment for Missile Master and Missile Monitor). Such courses vary in length from eight to 38 weeks.

Orientation Category

IN THE orientation category, three courses are now being given, designed primarily for senior officers who require a fairly comprehensive briefing based on the latest information. The NORAD Senior Officer Course provides general, flag and field grade officers assigned to North American Air



Students receive instruction on launcher control console in one of the many labs before being assigned to operating unit.



Missile tracking radar is explained to student officers, above, while electronics are studied in a laboratory, below.

Defense Command with general knowledge of the Army's air defense systems, problems and thinking.

The Senior Artillery Officer Course is specifically designed to refresh senior artillery officers, who have not recently been in a branch material assignment, on current air defense organization, equipment, tactics and operations.

In addition, the School offers a Modern Weapons Familiarization Course (MWFC) to senior Allied officers to acquaint them with modern weapons systems, tactics, nuclear weapons employment and modern organizational concepts. The last MWFC enrolled 25 Allied general and field grade officers from 19 countries.

Supervisory Courses

IN this area, branch officer training is provided. The normal Advanced and Basic Courses for reserve and regular Army officers are conducted as part of their general military education. In addition, retraining and refresher courses of four to nine weeks duration are conducted to qualify selected officers for assignment to duty with Nike or Hawk units.

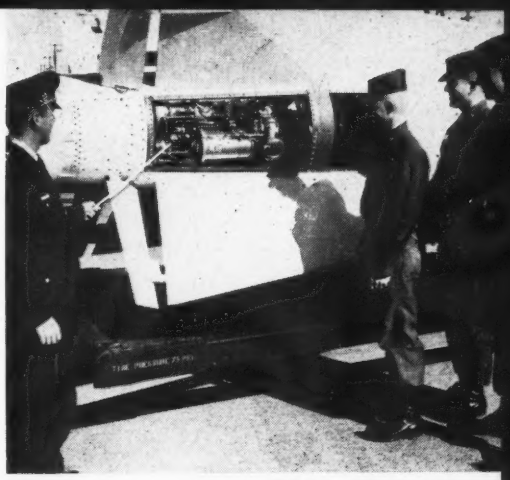
An interesting aspect of the Army Air Defense School is the Allied Student Battery where Allied students are housed together, study together and play together. Tischbein Hall, the Allied students' mess hall, caters to the national eating habits of these students as much as possible. More than 190 Allied students from 12 countries are now enrolled.

Although most Allied students have an excellent knowledge of English, interpreters usually are provided by their respective countries when a student is not proficient. The interpreters generally take the courses for which they will interpret before they assume their duties.

Two types of training are given to Allied students—unit and individual. In unit training, members of an organization are trained in their particu-

lar specialty to perform unit technician or supervisory duties. Frequently such courses are conducted in the students' native language—as at present, one course is being given in French and one in German. Allied units return to Fort Bliss annually for practice firings and refresher courses.

When an Allied student is trained as an individual, he is enrolled in an existing course and receives the same training as U. S. and other Allied soldiers. For example, five Allied students are now enrolled in the Defense Acquisition Radar Maintenance Course in company with 14 United States servicemen.



Before firing a Nike-Hercules missile, students are instructed in intricate mechanisms that make the weapon work.

Organization

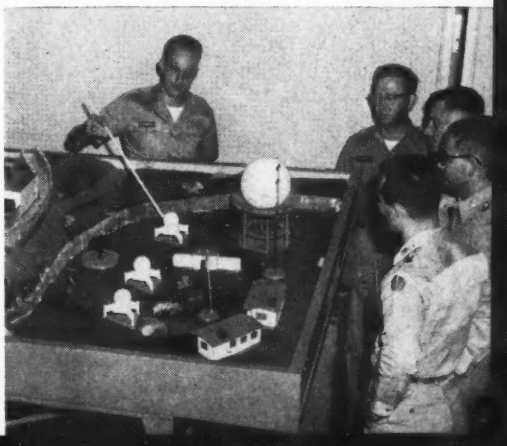
TO CARRY on its many activities, the School is organized on a staff level and an operating level. The staff is concerned with development of policy and coordination of administration and management, while the operating forces consist of those teaching departments that conduct all instruction.

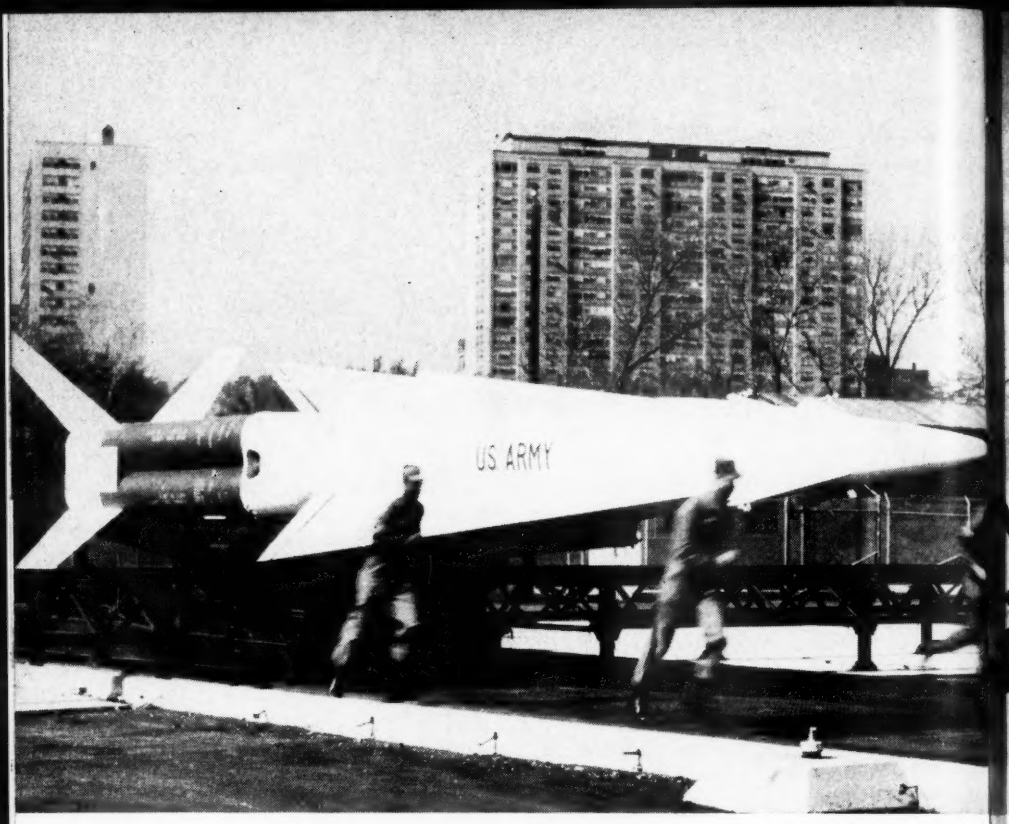
The Deputy for Administration and Management serves as adjutant, comptroller, security officer and logistician. He is responsible primarily for current activities and operations in these fields.

The Deputy for Plans and Operations prepares plans for accomplishment of future training missions; determines requirements for personnel, equipment, facilities and training devices that will be needed to support these plans and takes action to implement them; he also is responsible for non-academic daily operations.

The Deputy for Combat Developments and Research is concerned with determining what air defense equipment will be required in the 1965-70 time period and how it is to be used. He must have extensive and accurate knowledge of science, industry and the enemy threat. Based on such knowledge, he is able to estimate intelligently future air defense equipment needs and effective techniques for their employment. His 1960

Turkish interpreters, above, get first-hand knowledge of missile. Sand table, below, displays working of a Nike site.





Trained at the School, a Nike-Hercules crew goes into swift action at an Air Defense Command missile site in Chicago during launcher area readiness drill.

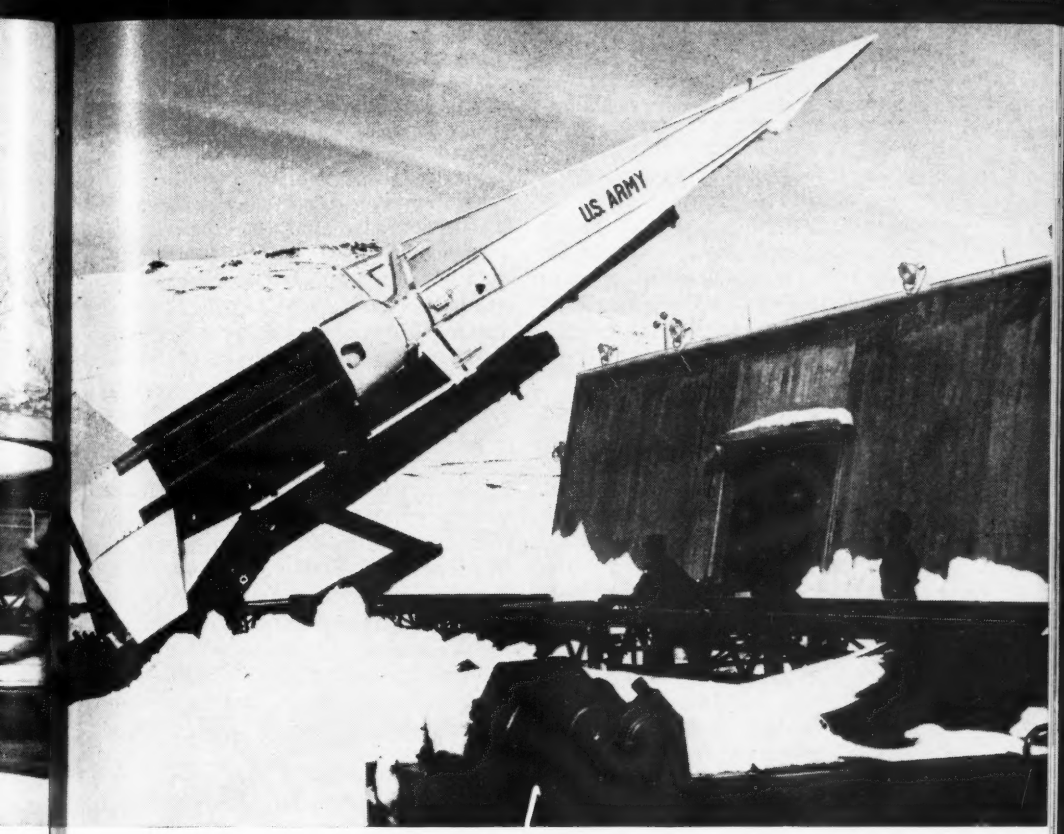
recommendations, for example, will indicate to a large extent the types of weapons we may have ten years from now. He also has primary staff responsibility for research and analysis, and he supervises and coordinates the research and analysis activities of the academic departments.

The School Support Command is the military organization to which all School personnel are assigned. Its primary mission is to provide administrative and supply support normally provided by any military organization. It pays, promotes, disciplines, feeds, trains and houses students, staff and faculty assigned to the various departments and offices of the School.

The Deputy for Instruction is the "Dean" of the School. He bears primary responsibility for all academic operations. His principal task is to supervise and coordinate activities of the five academic departments. Academic functions that lend themselves to centralized control are performed in his office under his direct supervision. These include training of instructors, class scheduling, modifying courses to keep pace with new developments, analyzing instruction quality, evaluating instructors and preparing training literature and other aids.

Academic Departments

NOT ONLY do the five academic departments teach, but each participates in development of air defense doctrine which falls within its assigned area of responsibility. The five departments are Command and Staff, Electronics, Non-Resident Instruction,



Under severe weather conditions, another crew atop Chugash Mountains in Alaska keeps constant vigil. Men will return annually to Fort Bliss for firing.

Low Altitude Missile, and High Altitude Missile. Each also conducts research and analysis on its own equipment to provide instructors with a solid foundation of experience.

Command and Staff Department is essentially designed to train officers. It teaches air defense tactics, command and staff subjects, combined arms and nuclear weapons.

Electronics Department. Because of the fundamental importance of electronics and radar in air defense, this department occupies a position of considerable importance. It instructs in basic electronics, electronic warfare, missile science, acquisition radar and fire distribution systems.

Non-Resident Instruction Department conducts correspondence courses in which some 5,000 are at present enrolled. This department also prepares Department of Army training films, field manuals, pamphlets, training programs and other publications pertaining to air defense artillery.

Low Altitude Missile Department conducts instruction in the Hawk, the Army surface-to-air missile.

High Altitude Missile Department conducts instruction in Nike-Ajax and the second generation Nike-Hercules.

Related Activities

THE School is not engaged exclusively in instruction; its other activities include school publications, experiments in teaching through television, research and analysis, keeping in close touch with development of coming weapons such as Nike-Zeus.

The Publications and Training Aids

Division maintains a field printing plant and facilities for constructing training aids. The printing plant produces manuals, pamphlets, lesson plans and instructional information aids for both resident and non-resident use. Several special School publications also are issued. During a typical month, the plant will print some 5,000,000 pages. (*See box.*)

Ever alert to technical innovations in communications and their application to military training, the School has a particular interest in use of closed circuit television. At present a closed circuit television installation using three cameras is used to teach classes of more than 200 students simultaneously. The facilities also are used in giving instruction on small equipment or in radar vans where space is limited.

Typical of the close regard the School pays to new developments is the attention now being given to development of the Nike-Zeus missile. Its growth potential will enable this weapon to cope with the more sophisticated future ballistic missiles. Planning and preparations to teach this system are progressing even as the system development proceeds.

In the area of research and analysis, a current activity is an analysis of missile firings and maintenance experiences to determine lessons learned and conclusions which may improve future equipment techniques and procedures. As an example of the value of such analysis, successful firings of Ajax and Hercules have increased substantially. This is attributable not only to improvement in materiel but to the increased knowledge, experience and training of firing personnel.

Part of this study seeks to determine effectiveness of Nike-Ajax and Nike-Hercules at low altitudes. Another study is being performed to determine failure rate of missile components and reasons for such failures. From these analyses come plans for modifying maintenance and supply.

Operation Understanding

EACH WEEK a large number of visitors, both civilian and military, are briefed on School activities. Many are brought here through Operation Understanding—a program conducted by the U. S. Army Air Defense Command to promote better public understanding of activities and missions of air defense units. Groups from communities where such units are on site visit Fort Bliss and the Command headquarters at Colorado Springs.

The School acquaints visitors with the organization and operations at Fort Bliss and the functioning of air defense missile equipment. A trip to the firing ranges to observe tactical firing is a highlight.

Visitors leave with a better understanding of the functions and problems of the school, and a better viewpoint of the Nation's air defense organization. They realize the contribution to national defense being made by the units of Nike-Ajax and Hercules, and the part that the Air Defense School is playing in providing such defenses.

LARGE-SCALE facilities for production of advanced type missiles in Western Europe are being established by the United States and the North Atlantic Treaty Organization, Major General August Schomburg, Chief of Army Ordnance Missile Command, recently announced as students from seven nations received diplomas at the Army Ordnance Guided Missile School, Huntsville, Alabama.

Belgium, France, West Germany, The Netherlands and Italy are preparing to produce jointly the new Hawk air defense missile which can destroy attacking aircraft from low to high levels, he told the graduates. Twelve NATO countries now have the Nike-Ajax and Nike-Hercules missiles.

As the tried and proved missiles of today are joined by other systems, the U. S. Army Air Defense School will be in the forefront of our Nation's defense effort—training the crews that man existing weapons and at the same time formulating the doctrine that determines to a large extent what future missiles will be required to meet any possible threats in the critical arena of the Nation's air defense.

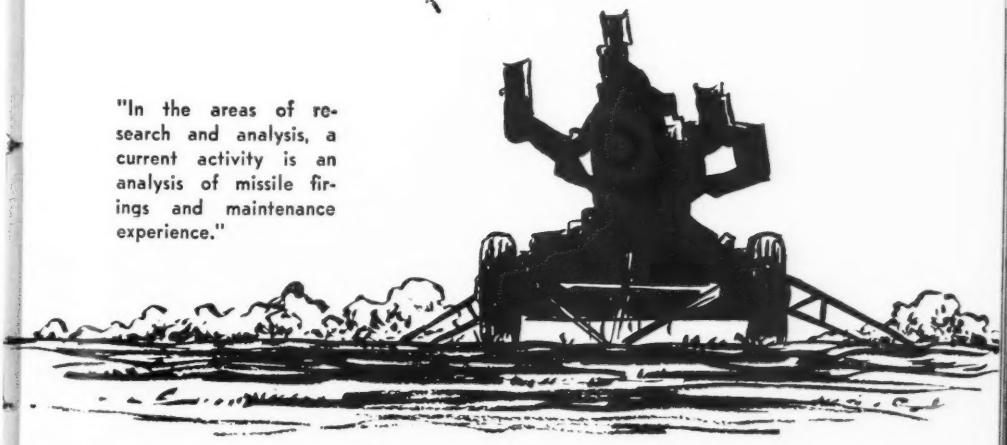
U. S. ARMY Air Defense School publications include two annuals, two monthlies, a quarterly, a bi-monthly and a bi-weekly output. The *Air Defense Digest* published annually meets needs of Army units and schools for a factual and unclassified document on air defense matters. The other annual is the classified *Air Defense Information Book*, published to inform senior commanders concerning the characteristics, capabilities and employment of air defense weapons.

The *Air Defense Executive Conference Report*, issued monthly, is designed to exchange information concerning activities and problems of the School, the Air Defense Board, Army Air Defense Command and others in the air defense field. The *School Research and Analysis Summary*, also a monthly, documents for internal use School efforts in this field.

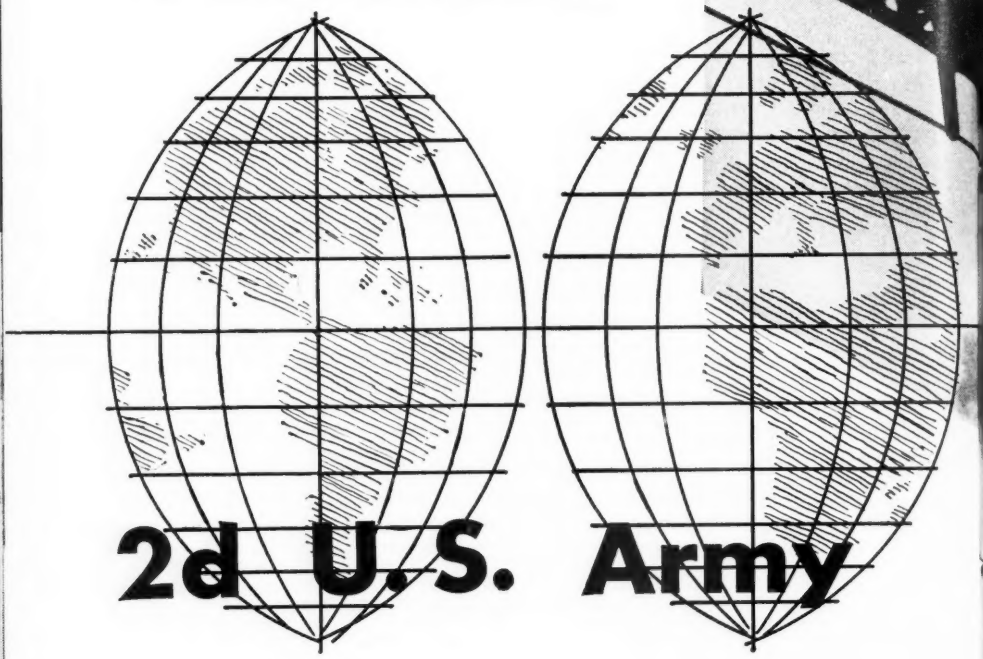
Technical information concerning equipment modifications and changes to operational and maintenance procedures is printed in the quarterly *Technical Command Report*.

Progress Report, published bi-monthly, documents the School's activities and accomplishments and informs higher headquarters. The *Guided Missile Newsgram* is printed bi-weekly to inform Department of Army, U. S. Continental Army Command, theaters and various Air Defense commands concerning materiel developments in guided missiles.

"In the areas of research and analysis, a current activity is an analysis of missile firings and maintenance experience."



Delivering atomic fire support in any area of the world is the task of STRAC's ready-to-go



2d U.S. Army Missile Command

TO BE truly dynamic, combat organizations must constantly adjust to changing conditions, including advances in technology and the availability of new equipment. This is particularly true of the 2d Missile Command—largest such unit in the U.S. Army and newest member of the Strategic Army Corps. While organizational concepts may be expected to undergo further revision, this article provides an interim report on one of the Army's newest combat organizations. —*Editor.*

"TO PROVIDE atomic fire support to United States or Allied Forces in any area of the world. To be moved to the designated area by the most expeditious means with minimum warning."

This, in essence, is the mission of the United States Army's largest Missile Command—the 2d U. S. Army Missile Command (Medium) of the Strategic Army Corps (STRAC).

Since the 2d Missile Command was activated in March 1957, the question has been asked many times whether

nd (Medium)

Colonel Kenneth F. Dawalt

such an organization is really needed. World tensions during the past four years provide the answer—an obvious, resounding "yes." Meanwhile, as demonstrated in frequent field exercises and mobility tests, the Command has developed into a smoothly working combined arms unit capable of performing its STRAC mission with minimum warning.

COLONEL KENNETH F. DAWALT, Artillery, is Commanding Officer, 2d U. S. Army Missile Command (Medium), Fort Carson, Colorado.

"To accomplish its mission, Medium Missile Command is organized as a combined arms team around four Honest John rocket battalions, one Corporal battalion."

NOW located at Fort Carson, Colorado, the 2d Missile Command was originally activated at Fort Hood, Texas, in March 1957*. By July, all major units had been assigned—some were activated at Fort Hood, while others were in being at Fort Sill, Oklahoma, and Fort Bliss, Texas. These units were moved to Fort Hood, and by February 1958, the entire Command was located at Hood.

Following extensive field training, the Command moved on permanent change of station to Fort Carson, Colorado, in May 1959. The move proved to be a valuable mobility exercise. Eight hundred and fifty vehicles were moved 900 miles by road without major accident or incident, with all TOE equipment except oversize-overweight vehicles and classified materiel included in the convoy.

Upon arrival at Fort Carson, the Command launched into intensive training while carrying out certain Post improvements. A 4,600-foot, hard-surfaced runway was constructed in record time by the organic Engineer Battalion. In Army Training Tests administered during FY 1960, all units of the Command received ratings of at least "excellent" and nine of the fourteen units being tested received "superior." A recent U. S. Continental Army Command-directed mobility test exercise, Junction Spring, indicated that the Command is prepared to move on minimum notice. It can be rail-loaded and prepared to depart its home station well within the required time period.

*Since activation, the 2d Missile Command has been commanded by Brigadier General (then Colonel) Franklin G. Smith, Brigadier General (then Colonel) William C. Garrison, and presently by Colonel Kenneth F. Dawalt.

Organization

TO accomplish its stated mission, the Medium Missile Command is organized around four Honest John Rocket Battalions and one Corporal Missile Battalion. Total authorized strength is 282 officers, 57 warrant officers, and 3492 enlisted personnel. At full strength, the Command would approximate 5300.

The Headquarters and Headquarters Company is organized similar to a Division type Headquarters and Headquarters Company. The Command is authorized a Brigadier General with a General and Special Staff. Distinctive features of this staff organization are found primarily in the

G-2 and G-3 areas of operation.

In addition to normal intelligence activities, the G-2 is charged with General Staff supervision of target acquisition and works very closely with the Sky Cavalry Squadron, a relatively new concept in the target acquisition field. In addition, the G-2 Section provides officers and enlisted personnel, in conjunction with G-3, to the Fire Support Coordination Team (FSCT).

The G-3 is charged with providing the Fire Support Coordination Team to the Fire Support Coordination Center of the Supported Force. The FSCT is normally composed of two officers—one each from G-2 and G-3—and necessary enlisted personnel to perform 24-hour operation. There are no TOE spaces authorized for the FSCT and, as a result, this reduces the two General Staff sections by approximately 25 percent of their authorized strength.

Artillery Group is organized with a Headquarters and Headquarters Battery and four Honest John Battalions. (At present, only two Honest John Battalions are authorized by General Order.) The John Battalion has a Headquarters and Service Battery and one firing battery with four launchers per battery.

The mission of the Artillery Group is to provide tactical control and administrative supervision of the field artillery battalions.

Corporal Battalion is normally under the direct control of the Command. However, it is attached to the Artillery Group in garrison for administration and training. The Battalion has a Headquarters and Service Battery and one firing battery with two launchers. It provides the long-range punch for the Command.

Armored Rifle Battalion is the security force. The Battalion is organized with a Headquarters and Service Company and four letter companies, two of which are activated. It provides protection against airborne and guerrilla attack to the atomic delivery units, Command and signal installations, and logistical installations. In addition, the Battalion provides a security screen for convoy movements and firing positions. The Command mobile reserve is also drawn from the Armored Rifle Battalion. Field experience indicates that this unit would need augmentation upon commitment of the Missile Command.

Sky Cavalry Squadron is a unique organization in the Command. Organized with a Headquarters and Headquarters Troop and three line troops, the Squadron has the mission of providing battlefield surveillance and target acquisition for the Command. Equipment organic to the Squadron includes Side-Looking Airborne Radar (SLAR), the SD-1B Drone System with photo capability, L-19 and L-20 aircraft with photo capability and airborne television. Target information is translated into target intelligence through the Command Intelligence Center and transmitted to the Fire Support Coordination Center for the decision to fire.

Engineer Battalion is organized with a Headquarters and Headquarters Company and three letter companies. "C" Company is a small camouflage unit, utilized primarily in an advisory capacity. In addition, the Battalion is augmented with an Engineer Geodetic Survey Detachment and an Engineer

Aircraft and drones provide target information which is transmitted to Fire Support Coordination Center.

Survey Platoon with primary missions of establishing survey control and carrying this control forward to the artillery and radar control points. The Battalion possesses the atomic demolition capability for the Command. The Engineer Field Maintenance Detachment (3d Echelon), normally organic to the Supply Group, has been attached to the Battalion to facilitate Engineer activities.

Supply Group provides internal logistical support to include limited third and fourth echelon maintenance facilities. Headquarters and Headquarters Detachment provides centralized control, as well as administrative support for units lacking that capability. The Medical Company is capable of establishing a one-hundred bed field hospital, medical supply, and limited evacuation facilities. Quartermaster Company provides services similar to a Division QM Company. Chemical Detachment provides third echelon nuclear, biological and chemical support and possesses a radiological monitoring and decontamination capability. Transportation Detachment (Aircraft Repair) provides third echelon maintenance support for all organic aircraft.

Ordnance Battalion is organized with a Headquarters and Headquarters Detachment, a Direct Support Company, Special Weapons Company, Corporal Support Detachment, and an Ammunition Supply Detachment. The Battalion is responsible for ordnance supply, third echelon maintenance of ordnance and special weapons, and ammunition resupply. It has the capability of establishing three Special Ammunition Supply Points to support employment over wide areas.

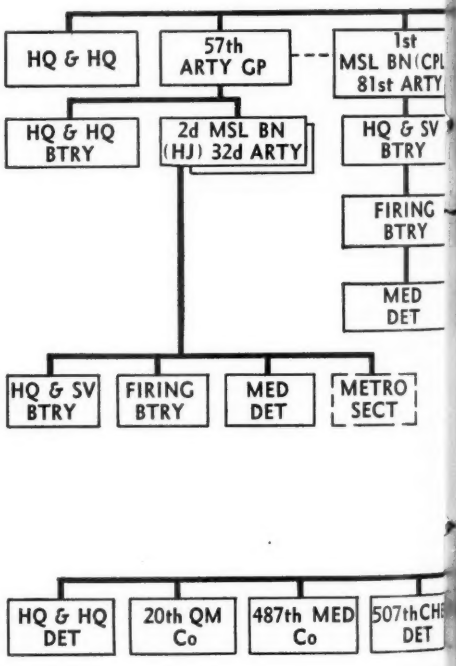
Signal Company provides internal communications for the Command Headquarters and the Supply Group complex in addition to providing area communications centers to four widely scattered areas. It also is responsible for third echelon signal maintenance and signal supply for all units.

Concept of Employment

THE Medium Missile Command would be used primarily to provide atomic fire support to U.S. or allied forces not possessing this capability.

The Command can be employed over an area up to 200 kilometers in width and 75 to 100 kilometers in depth. Assuming the supported force is an Allied Field Army with two Corps, two Honest John Battalions would be placed in support of each Allied Corps with the Corporal Battalion in general support of the Allied Army.

The Artillery Group Command Post, which is also the alternate main Command Post, is centrally located

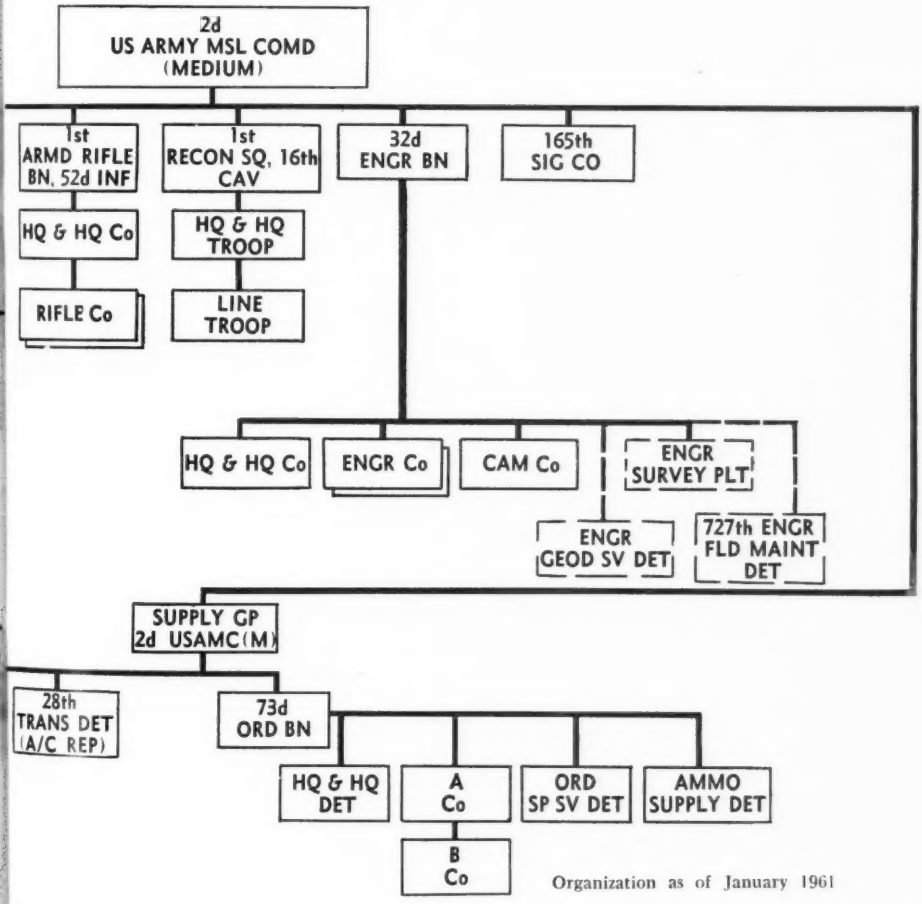


and normally near one of the Corps headquarters. The Supply Group Command Post is located along a main supply route. Each Group has Infantry and Engineer support, organic to the Missile Command, in close proximity.

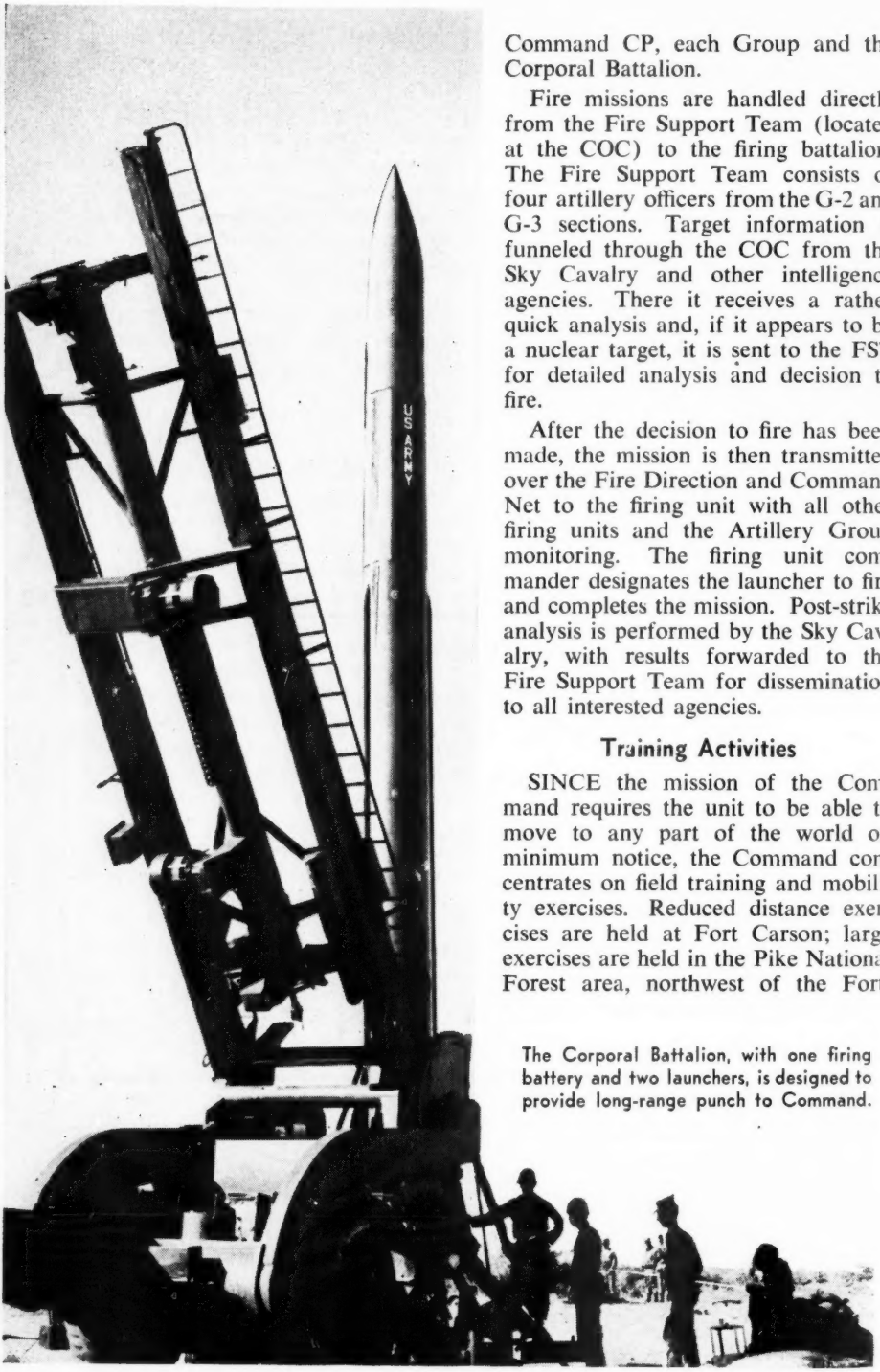
The Command Post of the Missile Command is located near the supported force headquarters. Normally, the Command Post consists of the Commanding General, G-2 and G-3 Sections, and the Fire Support Team. This is referred to as the "Command Operations Center" or COC. All other elements of the Headquarters are located at the main Command Post, about five to ten miles from the Supported Force Headquarters.

Although task force type organizations are not usually formed, the Infantry, Sky Cavalry, Engineers and Signal elements are given support-type missions in the area of operations of the forward elements. Headquarters of these units usually are located near the main Command Post or near one of the Group Command Posts.

The Ordnance Battalion has a capability of establishing three special ammunition supply points accessible to the Honest John Battalions and the Corporal Battalion. The Signal Company has organic equipment and personnel for four area communications centers. These are located near the



Organization as of January 1961



Command CP, each Group and the Corporal Battalion.

Fire missions are handled directly from the Fire Support Team (located at the COC) to the firing battalion. The Fire Support Team consists of four artillery officers from the G-2 and G-3 sections. Target information is funneled through the COC from the Sky Cavalry and other intelligence agencies. There it receives a rather quick analysis and, if it appears to be a nuclear target, it is sent to the FST for detailed analysis and decision to fire.

After the decision to fire has been made, the mission is then transmitted over the Fire Direction and Command Net to the firing unit with all other firing units and the Artillery Group monitoring. The firing unit commander designates the launcher to fire and completes the mission. Post-strike analysis is performed by the Sky Cavalry, with results forwarded to the Fire Support Team for dissemination to all interested agencies.

Training Activities

SINCE the mission of the Command requires the unit to be able to move to any part of the world on minimum notice, the Command concentrates on field training and mobility exercises. Reduced distance exercises are held at Fort Carson; large exercises are held in the Pike National Forest area, northwest of the Fort.

The Corporal Battalion, with one firing battery and two launchers, is designed to provide long-range punch to Command.

"The Medium Missile Command would be used primarily to provide atomic fire support to U. S. and allied forces not possessing this capability."

All units except the Corporal Battalion conduct live firings on the reservation. The latter unit moves to Oro Grande Range, New Mexico, annually for its service practice. Long-range communications, intelligence, and survey exercises are conducted using other military facilities throughout the state of Colorado.

Within the past twelve months, all units have completed Army Training Tests with ratings of excellent or higher. Mobility exercises include planning for movement by land, sea, air.

Mobility of the Command is equal to that of medium artillery. Although not referred to as airtransportable, the Command can be moved by air, utilizing C130 and C133 aircraft.

Problem Areas

WHILE the Medium Missile Command is one of the newest and most modern members of the U.S. Army, extensive field training exercises have indicated a need for modifications in organization and equipment. Target acquisition equipment must have longer ranges and give more definitive results. The organic infantry must be faster moving. Signal capabilities must be more responsive with greater ranges. Engineer support must include rapid bridging capabilities, and organic rockets and missiles must have greater ranges and be less complicated to the user.

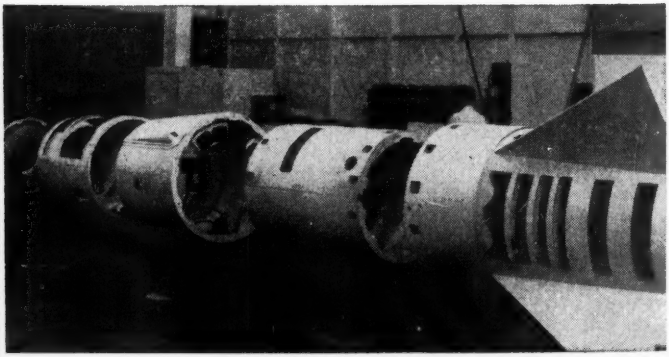
The improved Honest John and the Sergeant missile system will bring vast improvements; however, there is still a need for better communications, faster moving security forces, more flexible engineer support, and much improvement in the target acquisition field. Both the Department of the Army and the U.S. Continental Army Command are currently studying a proposed reorganization.

Proud of its role as member of the Strategic Army Corps, the 2d U.S. Army Missile Command (Medium) continues to maintain its high standards of training, to insure constant readiness to perform its vital mission.

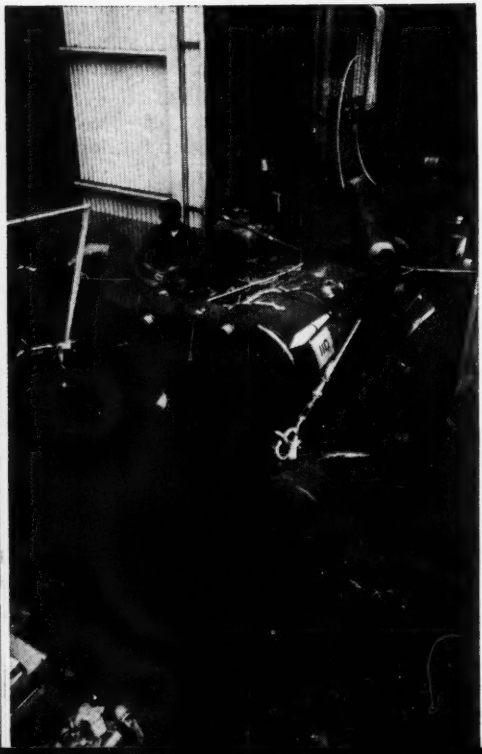
Army-industry teamwork pays off in

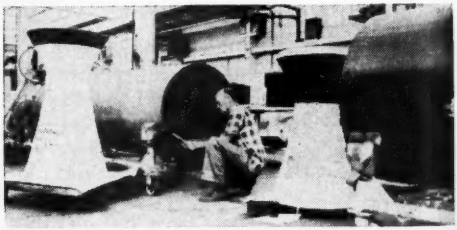
Nike-Zeus Prototype

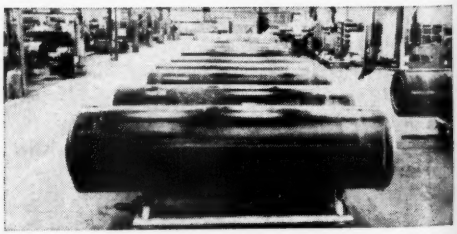
PREPARATORY to staging actual tests against far-flying intercontinental ballistic missiles, a prototype of Nike-Zeus has been produced for research and development firings. Developed through joint efforts of the U.S. Army and industry, the Nike-Zeus is designed to intercept incoming enemy ICBMs. Western Electric Company is prime contractor; Douglas Aircraft and Bell Telephone Laboratories are subcontractors. Thiokol Corporation is building the 450,000-pound thrust motor.



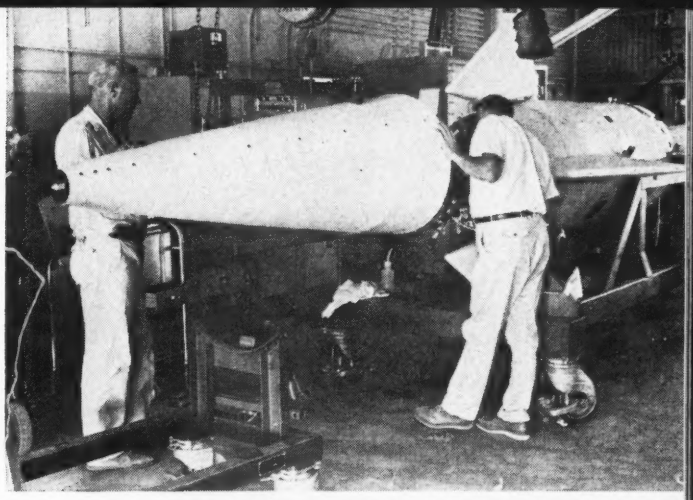
At Douglas Aircraft plant, mockup of warhead and a sustainer section is put together for thorough testing.







Vibration tests are performed on a warhead assembly, left, while above booster and sustainer motor cases are in process.



Then at White Sands technicians join the components of warhead before staging a research firing.

Final assembly of anti-missile missile is staged at White Sands, below. Right, a prototype is fired from underground pit.

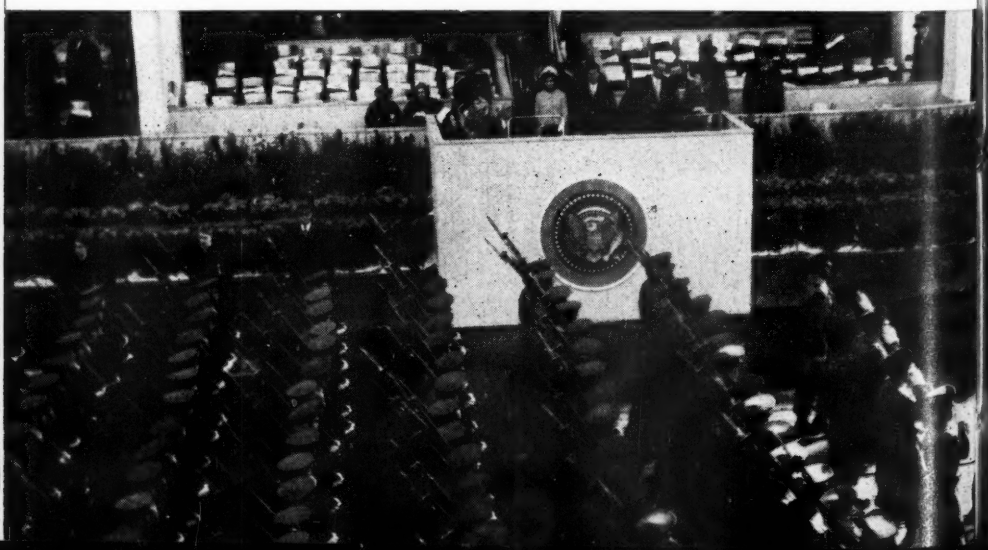
Fulfilling a traditional role with fanfare and ceremony,

The Army Goes to an Inaugural

SINCE the time of George Washington, military contingents have played a part in U.S. Presidential inaugurations. One battalion of infantry and one company of artillery participated in George Washington's first inaugural in New York City; and ever since, although the locale and other details have changed, the pageantry and the ceremony of marching military units have been indispensable. Not only do the Armed Forces serve as standard bearers of the Nation's honor and dignity—an essential element of the panoply of state—but their participation is emblematic of the President's role as Commander in Chief of the Nation's Armed Forces.

True to tradition, an Armed Forces Participation Committee provided the troop units, logistical support and planning to make the military support of the 1961 Presidential Inauguration a success. Coordinating Commander of the multi-service committee was Major General C. K. Gailey, Commanding General of the Military District of Washington. Under General Gailey's direction, the operations of the joint sub-committees

Since the first presidential inauguration, military contingents have been part of the colorful ceremonies attendant upon swearing in of a new Commander in Chief.



charged with the various facets of defense participation were coordinated with each other and with the 1961 Inaugural Committee, under Mr. Edward Foley.

U. S. Army participation in the event was highlighted by a parade from the Capitol to the White House. The United States Army Band and an honor escort of the 1st Battle Group, 3d Infantry—the famed "Old Guard" —accompanied the presidential party, which preceded the parade down Constitution and Pennsylvania Avenues to the White House.

Prominent in the parade was the Corps of Cadets of the U. S. Military Academy, in traditional full dress uniforms, marching in precise drill formation.

The 2d Battle Group, 504th Airborne Infantry provided another trim marching unit which showed the Army at its best. The 3d Armored Cavalry contingent with its M-60 tanks represented the fast, mobile and hard-hitting armor of the modern Army. Artillery detachments displayed the Army's rocket family—Little John, Hawk, Lacrosse, Nike-Hercules, Pershing and Nike-Zeus.

Symbolizing the One Army concept, the military portion of the parade also included members of the Army National Guard, Army Reserve and the Reserve Officers Training Corps; additionally, elements of these components in many cases participated as part of state contingents.

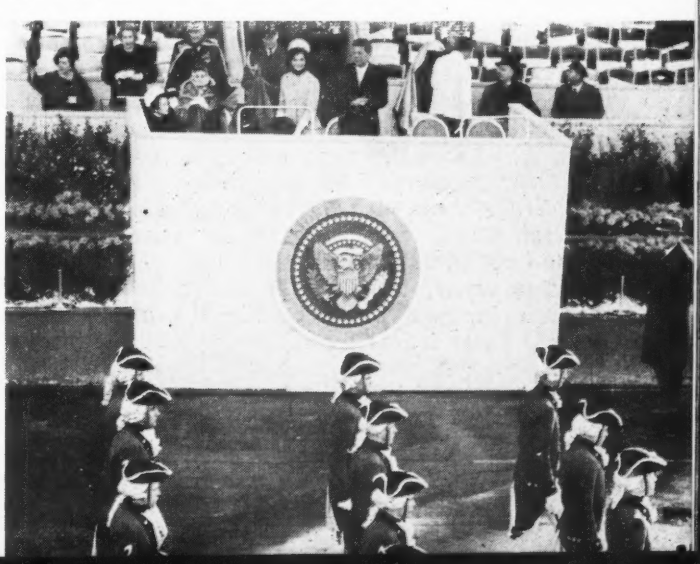
The Army provided its share of music, with the United States Army Band, the U. S. Army Field Band, the WAC Band, the District of Columbia National Guard Band, the Citadel Band, and the U. S. Military Academy Band.

The Army also joined with the other services to provide an honor cordon at the Capitol, cordons along the line of march, color guards for the parade, military aides for officials, and Armed Forces Police.

Not the least of the Army's contributions was the logistical support it provided for the entire parade. Of the nearly 2000 servicemen and women involved in this phase of support, approximately 700 were Army personnel.

In an emergency snow removal operation preceding the Inaugural Parade, some 1000 Army Engineer troops from Forts Belvoir and Meade manned trucks and scoop loaders to clear away a heavy snowfall that blanketed the route.

The Army's role in the ceremonies concluded with the Inaugural Ball events, for which the Armed Forces provided honor and color guards, martial music and escorts from the service academies.



Dressed in uniforms dating from time of Washington, members of "Old Guard" keep link with the past.

Commander in Chief

JOHN F. KENNEDY—thirty-fifth President of the United States—was born in Brookline, Massachusetts, on 29 May 1917, the second eldest of nine children of Joseph P. and Rose F. Kennedy. His father served in various posts during the administration of Franklin Roosevelt—as Ambassador to Great Britain, Chairman of the Securities and Exchange Commission, and Chairman of the U.S. Maritime Commission.

President Kennedy graduated with honors from Harvard University in 1940, and did graduate work at the London School of Economics and Stanford University.

In World War II, he saw action in the South Pacific as a PT boat commander. He was cited for "courage, endurance and excellent leadership" in towing injured members of his crew to safety, and bringing them through Japanese lines. In March 1945, he was retired for injuries by the Navy.

An author and journalist, he wrote in 1940 *Why England Slept,* an account of Britain's unpreparedness for war. His most recent book, *Profiles in Courage,* received the Pulitzer Prize in 1956.

President Kennedy's political career began in 1946, when he won a seat in the U.S. House of Representatives from the 11th Congressional District of Massachusetts. After serving three terms in the House, he was elected to the U.S. Senate in 1952 and again in 1958.

While a Senator, he served as member of the Foreign Relations Committee, the Labor and Public Welfare Committee, the Joint Economic Committee, and the Select Committee to Investigate Improper Activities in the Labor or Management Field. He was chairman of the Subcommittee on Labor.

Married to Jacqueline Lee Bouvier in 1953, the Kennedys have two children—Caroline and John F., Jr.

The incoming President and Commander in Chief has been awarded honorary Doctor of Law degrees by eighteen colleges and universities.

Robert S. McNamara
Secretary of Defense

ROBERT S. McNAMARA, the Nation's newly designated Secretary of Defense, was born in San Francisco, California, on 9 June 1916. After graduation from the University of California in 1937 where he was elected to Phi Beta Kappa, he attained a master's degree at Harvard Graduate School of Business Administration in 1939, then joined the accounting firm of Price, Waterhouse and Company in California.

In 1940, he returned to Harvard University as assistant professor of business administration. He also served in United States and England as a civilian consultant to the War Department, where he was instrumental in installing a statistical control system for the Army Air Forces. Subsequently, he was commissioned a captain in the Air Force and served in England, India, China and the Pacific. He was awarded the Legion of Merit and held the grade of lieutenant colonel upon discharge.

Mr. McNamara joined the Ford Motor Company in 1946, advancing through planning and controller posts to become vice-president, group executive, and director. He was elected president of Ford Motor Company on 9 November 1960.

The McNamaras are residents of Ann Arbor, Michigan. They have two daughters, Margaret Elizabeth and Kathleen, and a son, Robert Craig McNamara.

Elvis J. Stahr, jr.
Secretary of the Army

SCHOLAR, soldier, educator, attorney and administrator—that, in brief, describes the career of Elvis J. Stahr, jr., president of the University of West Virginia who has been named to be Secretary of the Army by President John F. Kennedy.

Born in Hickman, Kentucky on 9 March 1916, Mr. Stahr was graduated from the University of Kentucky, where he was elected to Phi Beta Kappa and was awarded a Rhodes scholarship. He spent three years at Oxford University in England, earning degrees as Bachelor of Arts, Bachelor of Civil Law nad Master of Arts, then became associated with a New York law firm. He was commissioned a second lieutenant in the U. S. Army in 1940 and served for two years in the Far East, advancing to lieutenant colonel.

Following World War II, he returned to law practice in New York. In 1947 he was appointed associate professor of law at Kentucky University, and a year later became Dean of the Law College.

During the Korean War Mr. Stahr served as special assistant to Secretary of the Army Frank Pace, Jr. In 1954 he was named Provost of the University of Kentucky. Two years later he accepted the post of Executive Director of the President's Committee on Education Beyond the High School. A year later he was named Vice Chancellor of the University of Pittsburgh. In 1959 he became President of West Virginia University.

Mr. Stahr is married to the former Dorothy Holland Berkfield. They have a daughter and two sons. The Stahrs make their home in Morgantown, West Virginia.

In an open letter to Army daughters and their parents on the sixtieth anniversary of the Corps, Col. Margaret Harper, Chief of Army Nurse Corps, cites the opportunities open to

The Army Nurse

Enrolled in Service to Humanity

Dear Nancy,

You are now finishing your senior year of high school and like thousands of other girls your age you are beginning to ask yourself -- "Do I want a career? What career should I choose? How do I go about preparing for it?"

I am writing to you personally because you are typical of thousands of Army daughters attending high school who are asking themselves these very same questions. Most of your life has been spent on Army posts; you are familiar with Army customs and traditions; and you have probably come in contact with Army nurses many times. Have you ever wondered what it's like to be an Army nurse?

I have decided to write to you, Nancy, on the sixtieth anniversary of the Army Nurse Corps partly to tell you what Army nurses all over the world are doing today, partly to tell you how you can complete much of your college education at Army expense as an Army student nurse, and partly to make you more aware of the overwhelming need for nurses not only in the Army, but throughout the entire country.

One of the first students to participate in Army Student Nurse Program when it began in 1956 takes oath as Second Lieutenant from Brigadier General R. B. Prentiss.

At present the Nation needs 70,000 more nurses. By 1970, it is estimated that this national shortage will be 270,000, a figure that rises with the population count. (Experts estimate that a minimum of one nurse is needed for every 285 persons in the United States.) The shortage carries over into the Army Nurse Corps which currently needs 1,500 more Army nurses. It needs them to maintain the high quality medical care that has always been given to our soldiers and their families. It needs them to be prepared in case of national emergency.

Today nurses, especially Army nurses, are prepared to cope with many challenges -- breathtaking advances in medicine, emergency situations, more exacting roles which nurses are being called upon to fill.

The life of an Army nurse is never dull. Assignments take them to Army hospitals all over the world. While most of them give bedside patient care, many are pioneering in a new field -- nursing

research. Others assist doctors in medical research both in hospitals and in laboratories.

In another field in which the Army Nurse Corps has pioneered, nursing methods analysts are concerned with improving nursing methods and techniques.

You will find Army health nurses visiting the homes of service families, conducting classes for expectant parents in baby care, and supervising school health programs.

Army nurses are also educators. They teach enlisted medical technicians and other nurses, including many from foreign countries. While they carry out these duties, they stand constantly ready to take off at a moment's notice for any part of the world where our troops are sent.

You probably remember how sixty of our nurses accompanied two Army field hospitals to Chile during the earthquake disaster last May.

The life of an Army nurse is more than excitement, however. Much of it is the satisfaction of knowing that you are helping others. There is, too, the satisfaction of working with other members of the medical team—doctors, dentists, medical specialists, veterinarians—and all others who work in the allied sciences.

HOW do you become a member of this team? Those who serve in the Army Nurse Corps must be registered nurses. To assist young girls in becoming registered nurses, the Army Student Nurse Program was established in 1956, in recognition of rising costs of advanced education and of the need for more professional nurses in the Army. Under this program, qualified student nurses may complete their last one or two years of nursing school—there are 1,100 such schools to choose from nationwide—with financial assistance from the Army.

For girls in four-year nursing schools who have completed their first two years, the program has recently been changed to provide full tuition and fees as well as higher rank and salary. Participants enter the program as enlisted reservists in the Women's Army Corps.

Benefits Under Army Student Nurse Program

THE Army Student Nurse Program has recently been revised to provide tuition, fees, higher rank and salary to students in four-year nursing schools. (*See opposite.*) The Program is open to qualified female student nurses who have completed the first two years leading to a bachelor's degree in nursing.

The new changes do not apply to Army Student Nurses in three-year nursing school programs. They will continue to receive the benefits listed below.

Interested students may receive more information about the Army Student Nurse Program by writing to The Surgeon General, Department of the Army, Washington 25, D. C., ATTN: MEDPT-MP.

Students Enrolled in Three-Year Diploma Schools of Nursing

1. Must have completed 2 years prior to selection.
2. Enlisted as WAC-USAR E-1 and promoted to E-2 after 4 months. Base pay $78.00 and $83.20 per month respectively.
3. Receive quarters and/or subsistence if not furnished by school. Amounts as high as $128.40 per month.
4. Student pays own tuition costs, books and incidental fees.
5. Following graduation and successful completion of state licensure requirements, commissioned as 2d lieutenant ANC-USAR and assigned to Army Medical Service School, Fort Sam Houston, Texas, for 8 weeks orientation.
6. Obligation: 2 years as an Army Nurse Corps officer.

The program remains unchanged for girls in three-year nursing schools. To help meet their tuition costs, they receive the pay of an E-1 ($78 a month) and later that of an E-2 enlisted reservist in the Women's Army Corps. If room and board are not furnished by the school, additional allowances may bring the total to more than $200 a month.

Following graduation, participants in the program for two years serve on active duty in the Army Nurse Corps for three years; participants in the program for one year serve on active duty for two years.

Through still another arrangement —known as the Registered Nurse Student Program—the Army financially assists registered nurses who can complete requirements for a bachelor's or master's degree in nursing within one calendar year.

AN Army nurse's education does not end the day she pins on her shiny new second lieutenant's bars. Throughout her career she continues to learn. She is trained as an operating room nurse, anesthetist, pediatric nurse or psychiatric nurse. She may attend an amazing variety of military and nursing courses, learning everything from the care of casualties during a large-scale emergency to the management of a large operating room suite. The Army sends many of its nurses to civilian educational institutions to earn higher degrees.

In its larger aspects, nursing is a postgraduate course in understanding people. An Army nurse comes in contact with everybody from privates to generals. Experience that only a military environment can provide, access to the latest in medical equipment and facilities, and travel to all parts of the world help develop her as a versatile individual.

Nursing is a permanent profession. It is not a skill or ability that disappears with age. It can be practiced on a full or part-time basis, leaving time for marriage and raising families. It is a profession to which you can always return in later life. It is, I feel, a profession of which you can always be proud.

ON ITS sixtieth anniversary, I am proud of the Army Nurse Corps. It has a history that dates farther back than its founding on 2 February 1901. Army nurses have taken care of our soldiers in every major war in which this country has participated, from the Revolution to the Korean conflict. Just as there will always be a need for a fighting force to defend our country, there will be a need for nurses and other medical personnel to keep our soldiers and their families in good health. You and other girls like you belong to the generation to which we are now looking to fill this need.

Margaret Harper

MARGARET HARPER
Colonel, ANC
Chief, Army Nurse Corps

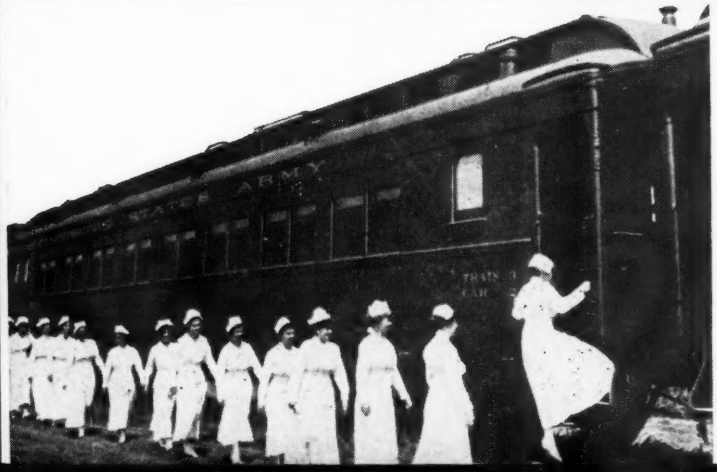
Students Enrolled in Four-Year Degree-Granting Schools of Nursing

1. Must complete 2 years prior to selection.
2. Enlisted as WAC-USAR E-1, promoted to E-2 after 4 months, promoted to E-3 at beginning of senior year. Monthly pay $78.00, $83.20, $99.37 respectively.
3. Receive quarters and/or subsistence if not furnished by school. Amounts as high as $128.40 per month.
4. Costs of tuition, books, and incidental fees defrayed by Department of Army.
5. Commissioned as 2d lieutenant ANC-USAR six months prior to graduation.
6. Following graduation and successful completion of state licensure requirements, assigned to Army Medical Service School, Fort Sam Houston, Texas, for 8 weeks.
7. Obligation: On program 12 months or less, 2 years as an Army Nurse Corps officer. On program more than 12 months but not to exceed 24 months, 3 years as an Army Nurse Corps officer.

A Proud History

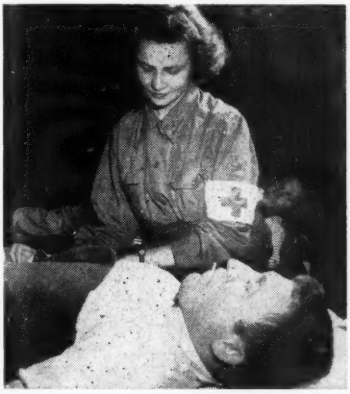
Care of troops by more than 1,000 "contract" nurses in Spanish-American War paved way for establishment of the Nurse Corps in 1901.

Over 8,500 served in Corps in World War I like group, below, at hospital in France. Left, nurses took part in victory march.



Hospital trains and ships were once used almost exclusively to transport patients over long distances.

During World War II, Corps reached peak of 57,000. Wherever fighting men needed aid, they landed to serve.



Here an Army nurse serves at field hospital in France, 1944.

Even in midst of war, Army nurses like the two at right in 1942 managed to visit historic European sites.

When U. S. troops were rushed to Korea in 1950, Army nurses like the one at left followed swiftly to staff the hospitals.

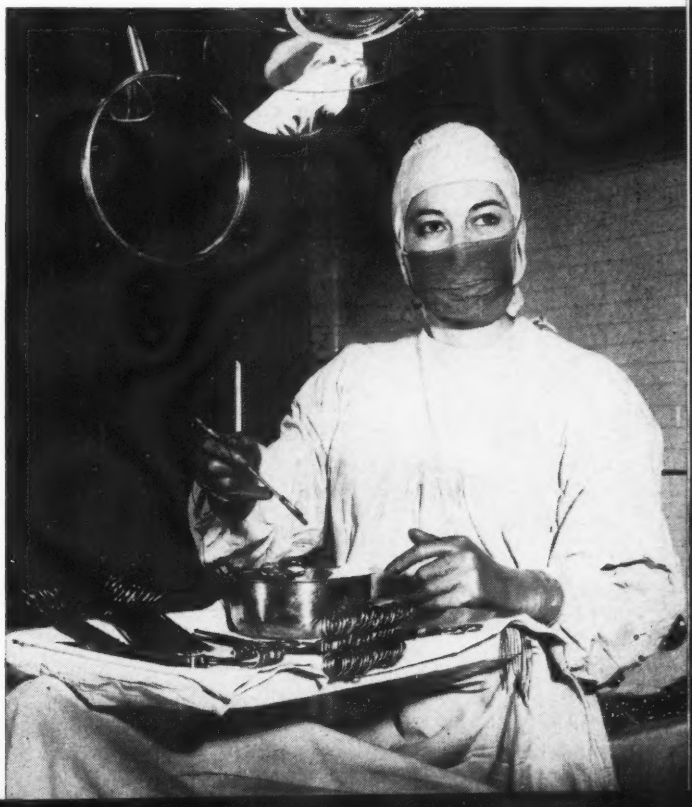
Today Corps members are ready to move on moment's notice, as this group on way to Chile earthquake in May 1960.

The Army Nurse Corps Today . . .

Wherever U. S. troops may serve, some 3,300 nurses are found in hospitals or other medical facilities.

Not only do they care for sick—they help with research in laboratories, like this study being conducted in oral hygiene, below.

They also teach others, as this one is doing with a group of WAC enlisted medical technicians, using cutaway model of the human torso for demonstration purposes.

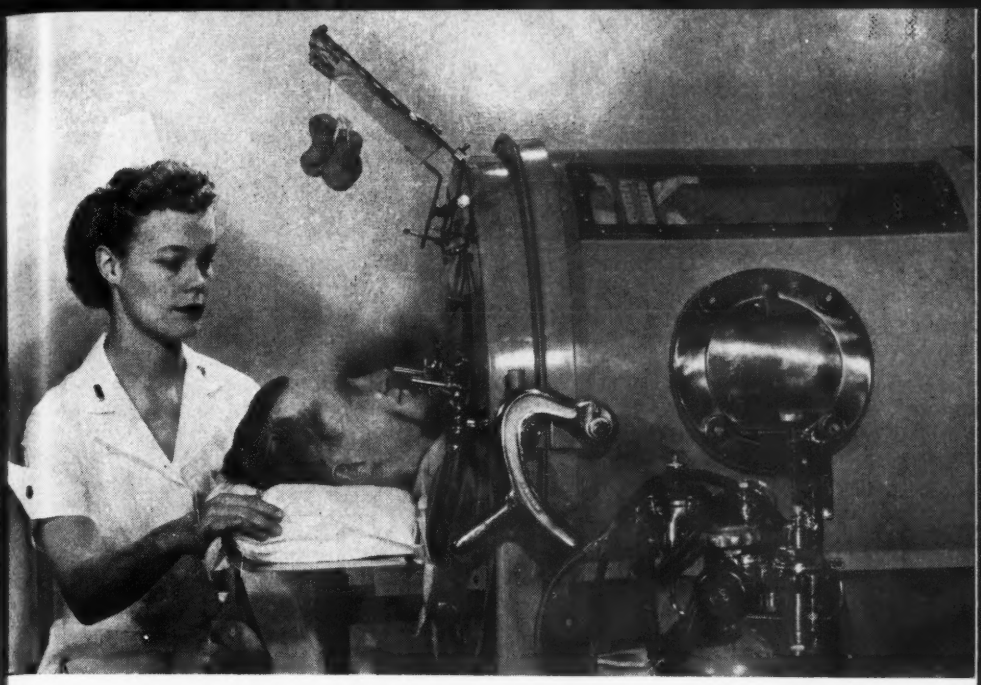


Many act as surgical assistants during operations performed in well-equipped Army hospitals around the world.

An Army nurse's education does not end the day she pins on her new bars. The Army sends many to civilian educational institutions to earn higher degrees.

Doctors and nurses work together as a team to provide soldiers with the best medical care.

Male nurses also serve in today's Corps. Here one takes jump training, in readiness to move anywhere with troops.



Patients often require specialized care that can be provided by nurses trained to operate complicated equipment.

They serve as health nurses as well as in hospitals, helping Army dependents through many unforeseen emergencies.

Practice of pediatric nursing is one of the many specialties that the young woman may choose for herself.

The 182d Infantry—the Minuteman's original outfit—lives up to its proud record as

Fountainhead of the Guard

Tom Monahan

FROM colonial train band to Pentomic battle group, the 182d Infantry of the Massachusetts Army National Guard has forged—along with the Massachusetts 101st Engineer Battalion—the longest continuous history of any military unit in the Nation.*

The 182d traces its origin to 1636 when a band of loosely disciplined but rugged pioneers joined together under Colonel John Haynes of Boston to form the North Regiment of militia in the Massachusetts Bay Colony. Because danger of attack from hostile Indians was always present, these men kept themselves in instant readiness, carrying their muskets even to church.

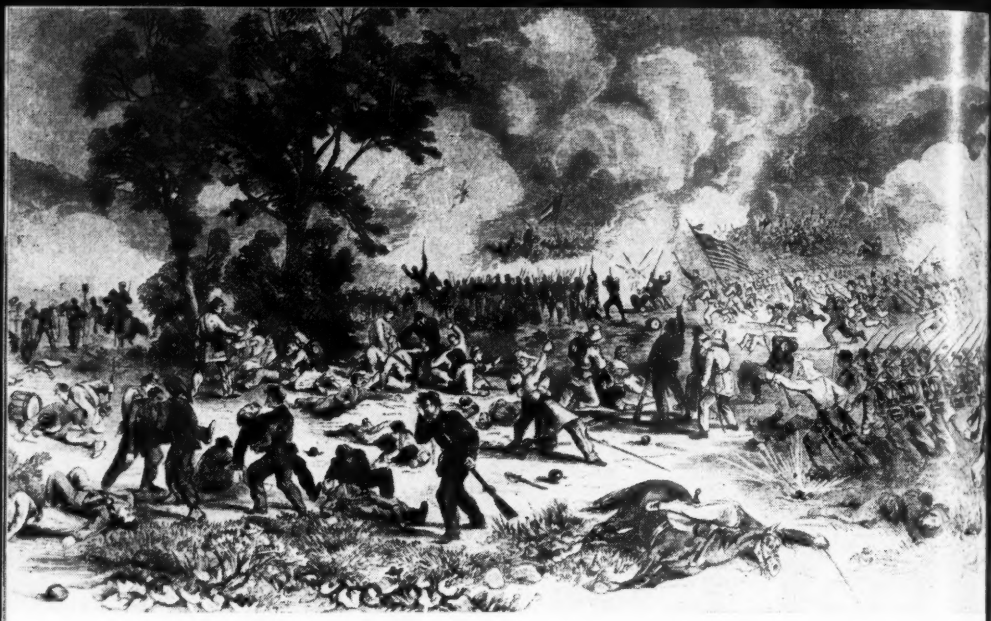
The Regiment first saw action with other militia units of the Massachusetts Bay Colony in the Pequot Indian War. In subsequent decades, as the threat of war waxed and waned, regimental discipline was often modified with the spirit of fellowship. But the history of the Regiment demonstrates that when patriotism and courage were needed its members unfailingly responded, participating in almost every principal national war or local emergency that came along since that day.

Today the unit has come full circle in its readiness, for once again, like their forebears of three centuries ago, the men of the 1st Battle Group, 182d Infantry, are disciplined and ready to face an enemy who might strike without warning.

The North Regiment was formed on 7 October 1636 from train bands, or groups of trained militia, which had been instituted in the colony six years earlier. The Regiment's commander, Colonel Haynes, had served as governor of the Massachusetts Bay Colony

TOM MONAHAN, formerly Historian in the Office of the Chief, National Guard Bureau, is assigned to Office of the Chief of Information, Department of the Army.

*The 182d Infantry and 101st Engineer Battalion, both Massachusetts National Guard, were organized in 1636 as the North and East Regiments, and for many years before World War I were designated as the Fifth and Eighth Massachusetts, respectively. The 101st Engineer Battalion also carries the honors of the celebrated Marblehead or Marine Regiment which manned the boats that carried Washington's army across the Delaware to fight the battle of Trenton.



At Battle of Bull Run, the regiment fought like regulars, and most of its casualties were suffered in some of the bravest action of the battle.

and later became the first governor of the Connecticut Colony.

In 1643, when Massachusetts Bay Colony was organized into counties, the unit was renamed the Regiment of Middlesex County, and it is still known in its home communities as the Middlesex Regiment.

During the century, the Regiment was twice redesignated, and defended Middlesex County in two more conflicts—King Philip's War (1675-1677) to put down the bloody uprising of the Wampanoag Indians, and King William's War (1689-1697), one of the European struggles between England and France that had its counterpart in a series of intercolonial wars in North America.

During much of the 1700's the Regiment continued as a relatively informal organization, but the growing conflict with England imparted new urgency to local defense. As a result, all the regiments of Massachusetts were required to organize part of their numbers as Minutemen, and as such, ready to take the field at a minute's notice. Thus the predecessors of the 182d were among the first to bear the appellation that is so cherished by the National Guard today.

Revolutionary War Record

IMMEDIATELY before the American Revolution, the Minutemen of Middlesex County were among the patriots that made Massachusetts a hotbed of revolutionary sentiment. At this time the 182d had the designation 1st Regiment of Middlesex. When the colonial craftsman Paul Revere rode to "every Middlesex village and farm" it was to the Minutemen of this famous Regiment that Revere and his companions were giving the alarm.

One of the Regiment's officers, Captain John Parker, was in command of the company of seventy Minutemen that waited on the Lexington Green at sunrise on the morning of 19 April 1776. It was Parker who is reputed to have said: "Stand your ground! Don't fire unless fired upon! But if they mean to have a war, let it begin here!"

By the time the British regulars reached Concord, other members of the Regiment had gathered, and a small company went out to meet the

Redcoats. It was this action "by the rude bridge that arched the flood" that Ralph Waldo Emerson hailed as "the shot heard round the world."

At this time, the regimental commander was Thomas Gardner of Cambridge. Therefore, when Gardner led many members of the Regiment into the Massachusetts Army for the siege of Boston, this group was designated Gardner's Regiment. The remainder of the Regiment was thereafter called the 1st Middlesex County Regiment of Militia.

The strategic key to the siege of Boston was the control of Charlestown and Dorchester Peninsulas. So it was that on the night of 16 June 1775 the American patriots fortified Breed's Hill on Charlestown Peninsula. The orders had been to fortify Bunker Hill, a variation which gave birth to the misnomer of the ensuing clash and the anomaly of Bunker Hill Monument being perched atop Breed's Hill.

Gardner's Regiment and the other patriots held their fire until they could "see the whites of their eyes," and helped to repulse the first two assaults of the Redcoats. Conspicuous among the regimental units was Josiah Harris' Charlestown Company, the indomitable defender of the rail fence that marked the patriots' weak left flank.

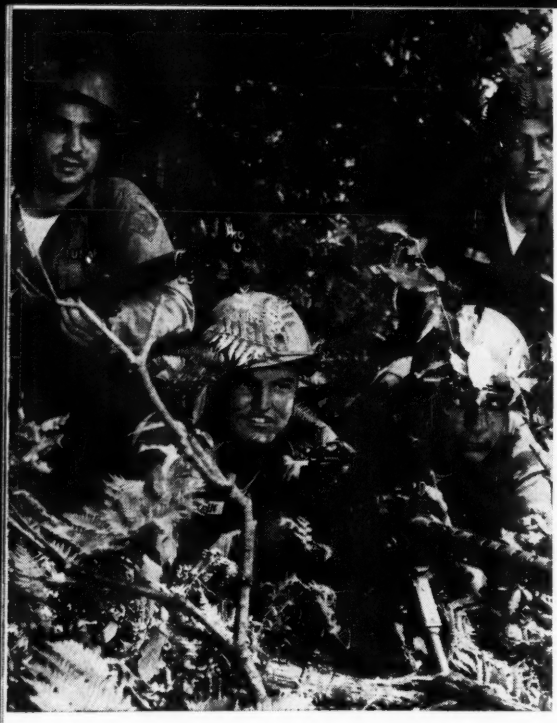
When the Colonials had to retire for lack of ammunition after the third British assault, and Gardner had been killed in the fierce hand-to-hand fighting, it was the brave Charlestown Company under Harris that saved the withdrawal route to the mainland. The Charlestowners' attack was the only American offensive of the day. The Regiment was called out several more times during the Revolution and responded to calls for replacements in the regiments of the Continental Line.

It was in 1806 that the Regiment first became the 5th Regiment, a designation it carries parenthetically today. In the War of 1812, the Charlestown Companies of the 5th Regiment were called into Federal service and guarded Chelsea and Charlestown bridges for the safety of the U.S. Navy Yard. The Regiment was redesignated the 4th Regiment in 1840, but regained its traditional "5th" in 1855.

Civil War Service

THE 5th was standing by on 18 April 1861—the 86th anniversary of the fighting at Lexington and Concord—when orders came to report for its first of three tours of duty in the Civil War. The initial service was for a three months' period, and was not over until the Regiment had fought bravely

As part of the Americal Division, troops of the regiment took part in this assault in the Philippine Islands.



Members of original "train band" of 1636 would be awed at firepower of the machine gun used by today's Guard.

at Bull Run. On the way down to Washington, the Regiment was paraded amid wild cheering in New York City, and the New York *Tribune* said the 5th was "as fine a looking body of men as can be found."

The 5th was quartered in the U.S. Treasury Building and drilled on the grounds of the U.S. Capitol in the weeks before the Bull Run combat. On the day of the battle, the 5th crossed the ford at Sudley Church and advanced to a nearby hill under withering Rebel fire. Their coolness and order under the terrific fire caused the green militiamen to be mistaken for regulars.

The 5th was one of the few regiments to behave like regulars that day and its withdrawal was in marked contrast to the confusion that generally prevailed. Most of the casualties of the 5th were suffered in some of the bravest action of the battle, when the 5th supported New York's Fire Zouaves in three times routing the Confederates from Ricketts' battery in the give and take of the engagement.*

In September of 1862 the 5th volunteered for nine months service and was sent by sea to North Carolina where it participated in several engagements, most notable of which resulted from the Goldsboro Expedition in December of 1862.

Goldsboro was an important station on the main railroad line between Richmond and the extreme south; and the expedition was aimed at cutting Robert E. Lee's southern communication line while he faced the Army of the Potomac at Fredericksburg. The 5th helped drive the Confederates from Goldsboro, set fire to the railroad bridge, cut telegraph wires, and tear up a mile of track. Then the 5th climaxed the action by driving off a Rebel attack as the expedition made its way back to New Bern, North Carolina.

In its third tour of duty in the Civil War, the 5th volunteered for 100 days service in July 1864. Garrisoned in Baltimore, the Regiment supervised the movement of recruits and convalescents and guarded the polls when Marylanders adopted their new Constitution.

Following the Civil War, the Regiment reverted to its former State organization and was called upon several times for State emergency duty, particularly the Boston fire of 1872. In the Spanish-American War, the Regiment served in the United States as the Fifth Regiment Massachusetts Infantry, United States Volunteers

*A score of men from the 5th were taken prisoner at Bull Run and spent 10 months in Confederate prisons before their exchange. While at first housed in a Richmond tobacco factory, they were under the immediate charge of two Confederate officers, Captain Henry Wirz and Lieutenant David H. Todd. The former was later to gain notoriety as the commander of the Andersonville prisoner camp and the latter was Mrs. Lincoln's half brother.

In Federal Service

THE 5th responded to calls by the Commonwealth of Massachusetts for the Chelsea fire in 1908, a civil disturbance in Lawrence in 1912, and the Salem fire in 1914. But its next call to Federal status did not come until 1916, when the Regiment went into training at El Paso, Texas, during the Mexican Border service.

The 5th was again mustered into Federal service on 2 July 1917, but a few weeks later about 1400 officers and men were transferred from the 5th to the newly formed 101st Infantry of the 51st Brigade, of the 26th Division. In February 1918, the 5th was redesignated as the Third Pioneer Infantry Regiment, and underwent training at Camp Wadsworth, South Carolina, for duty as Corps troops.

Arriving overseas in September 1918, the Third Pioneer Infantry was assigned to duty with G-4 and participated in the Meuse-Argonne offensive. As part of the Army of Occupation, the Regiment was detailed to the Chief of Ordnance for destroying German ammunition in the Meuse-Argonne area, and later the Third served as the railroad police regiment of the A. E. F. Meanwhile, those men of the former 5th transferred to the 101st Infantry contributed to the distinguished combat record of the 101st.

Following World War I, the unit was returned to State status and reorganized first as the 5th Infantry before being designated in March 1923 as the 182d Infantry. When floods imperiled Massachusetts during March and April 1936, the 182d was called out for emergency duty at Lowell. The Regiment was called out again in September 1938, as a hurricane struck New England and caused widespread wind damage and flooding.

Pacific Action

AS the threat of war mounted late in 1940, the 182d again received orders for Federal service. After intensive training, the 182d was separated from the 26th Division and on 23 January 1942 it was sent to the South Pacific with Task Force 6814, the foundation of the famed Americal Division.

While other Army units had made attacks in order to repulse Japanese invasion forces, the Americal Division began the U. S. Army's first offensive combat in World War II when it was sent to Guadalcanal to reinforce the 1st Marine Division.

Beginning what was to be one of its

Modern infantrymen charging Aggressor troops in a tactical training exercise have same indomitable spirit as their forerunners who engaged in action at Bunker Hill.

proudest chapters, the 182d landed on the rugged tropical island on 7 November 1942. The Regiment had its first taste of combat even while the ships were being unloaded that day as 30 Japanese fighters and torpedo bombers struck the anchored convoy. Members of Company H used one of their machine guns to bag one of the 26 planes shot down.

A few days later, the 1st and 2d battalions of the Regiment helped establish a bridgehead west of the Matanikau River against heavy Japanese opposition. All battalions of the Regiment participated in the later operations that eliminated the stubborn Japanese resistance on Guadalcanal. For this initial and significant campaign, the 182d proudly carries a Presidential Unit Citation (Navy).

The 182d was then stationed on the Fiji Islands until it was sent with the Americal Division to Bougainville late in 1943. The 182d was in the front lines when the Japanese launched their last-ditch counteroffensive in March 1944. It has been said that heroism became routine in the 182d's determined 19-day fight for Hill 260, where the Regiment engaged in some of the most bitter fighting of the campaign. It was here that Company E earned a Distinguished Unit Citation for its relentless courage in the face of staggering casualties.

In spite of heavy casualties, the 182d made repeated counterattacks before it shattered Japanese resistance. Until early in December 1944, the 182d maintained almost continuous contact with the enemy as the Americans subdued the remaining Japanese forces on the island.

In January 1945, the 182d landed in the Philippine Islands for the final stages of the Leyte Campaign. The 1st Battalion liberated the Island of Samar; the 2d Battalion was assigned to patrol and guard missions in the Capoocan Area and the 3d Battalion was responsible for elimination of remaining resistance in the Camotes.

On 26 March 1945, the 182d made an assault landing on Cebu in the Southern Philippines and surged forward despite mine fields and suicidal demolition parties. The Regiment took Cebu City two days later, and met heavy enemy fire throughout much of April 1945 as it took several strategic hills beyond Cebu City.

After helping to mop up the last remains of enemy opposition on Cebu,

Members of the First Battle Group move in on enemy tanks during training maneuver at Camp Drum, New York.

the 182d began training for the invasion of Japan. The Regiment earned a Philippine Presidential Unit Citation for the period covering the Leyte and Southern Philippines Campaigns. Following the Japanese surrender, the 182d was among the early units to begin the occupation of Japan, going ashore at Yokohama on 8 September 1945.

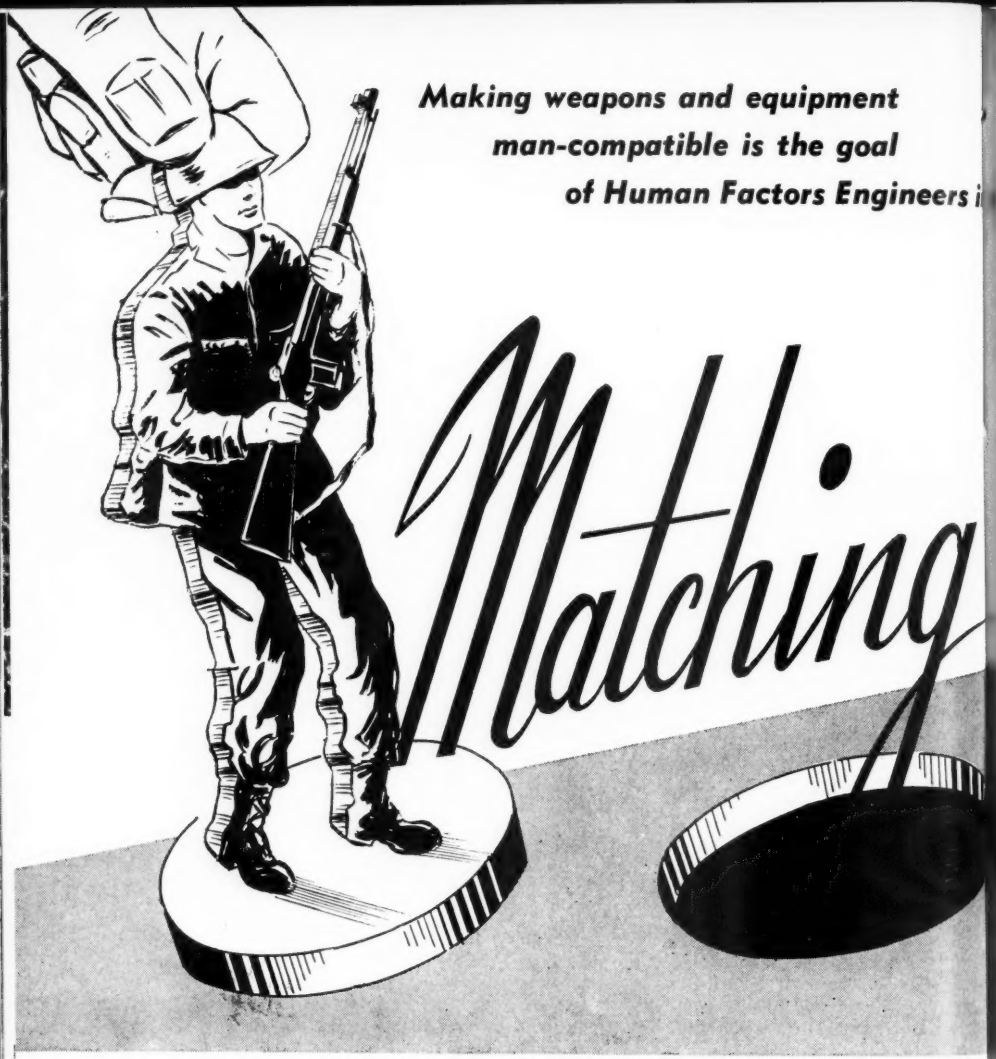
Maintaining a constant state of readiness calls for training in the latest weapons such as jeep-mounted recoilless rifles.

Postwar Organization

THE 182d returned to the United States late in November 1945 and was reorganized 5 December 1946 as an element of the 182d Regimental Combat Team. The Regiment was not called into Federal service during the Korean War, but more than 400 individual members of the Regiment volunteered for active duty. Continuing its fine record as a unit of Massachusetts, the Regiment came to the aid of the State several times during recent years including service during hurricanes in 1954 and 1956 and forest fires in 1957.

In May 1959, when the 26th Infantry Division was reorganized under the pentomic concept, the 182d became one of the Division's five battle groups. Training for the atomic battlefield, the Battle Group is a far cry from its musket-bearing predecessor, and its key position in the Nation's second line of defense fails to compare with its initial role as a community defense against Indians. But as a safeguard for free people, its elemental purpose has not changed in 325 years.

Training for the atomic battlefield, the Battle Group is a far cry from its predecessor but as safeguard for free people its purpose has not changed in 325 years.



Making weapons and equipment man-compatible is the goal of Human Factors Engineers i

Matching

THE first Stone Age cave man who fastened a sharp rock to a club, thus developing a weapon better than his neighbor's, created the first problem in human factors engineering. And while human factors engineering as an applied science is relatively new, its necessity is repeatedly being emphasized by the mounting complexity of modern weapons and materiel.

MASTER SERGEANT MERRILL S. HARRISON is assigned to the Public Information Office, Aberdeen Proving Ground, Maryland.

World War II and the Korean War demonstrated clearly that weapons do not fight alone, that weapons are only as effective as the soldiers who man them. Army Ordnance Corps, the staff agency responsible for furnishing weapons to the Army, early recognized that the effective mating of the man and the machine required that weapons, vehicles and other equipment be designed and built to enable man to operate them with ease, with minimum instruction time.

It is today's job of the human

Men and Materiel For Combat

Master Sergeant Merrill S. Harrison

factors engineer to insure that weapons and machines now under design and development will meet this primary military specification on the battlefield of the future.

Engineers at Work

AMONG the scientists at work at the Army Ordnance Corps Human Engineering Laboratories at Aberdeen Proving Ground, Maryland, are two young psychologists—Sam Hicks and Charles Fried. Sam Hicks has been conducting an engineering study on the M-113 armored personnel carrier. Results of his study will significantly affect the design of military vehicles of the foreseeable future when soldiers enter battle in armored vehicles.

Charles Fried has been conducting a study on radar scopes. His information will affect the design of radars of the future when more soldiers will be required to operate radar scopes to track planes, missiles and other tools of war, both friendly and enemy.

In their respective spheres, these engineers are concerned with the active soldier, the man who fights with a gun, and the sedentary soldier, the man who fights with a radar scope.

The first type of soldier is offensive-minded. He attacks an armed enemy. He seizes an enemy position. He kills. The second soldier is an interpreter of information. How well he interprets that information may determine whether an American city or field position is destroyed by an enemy or whether the attacker is destroyed.

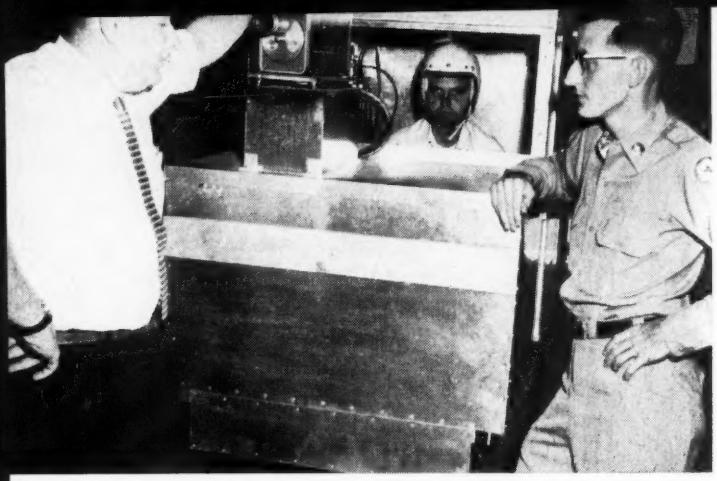
Common Elements

THE problem of fatigue concerns both human factors engineers. The soldier going into battle cooped up in an armored personnel carrier becomes fatigued. This lowers his combat efficiency, his ability to fight on the ground.

The radar operator sitting before his scope in a darkened room also is subject to fatigue. Fatigue lowers his vigilance and alertness, his ability to interpret and transmit correctly the information appearing on the scope.

It is the task of these human factors engineers—utilizing a scientific approach which eliminates human errors in judgment, insofar as possible, through use of laboratory equipment and trained personnel—to provide a basis for recommendations for developmental action, including the suitability of the item for service tests.

In essence, their work involves "the application of scientific principles concerning human physical and psychological characteristics to the design



Development of a television driving system for combat vehicles is under study by human engineering experts.

of equipment to increase the speed and precision of operations, provide maximum maintenance efficiency, reduce fatigue, simplify operational requirements, and reduce training time."

Extent of Organization

THE Army Ordnance Corps Human Engineering Laboratories were organized, on a small scale, as a two-branch laboratory in 1952. Today they include three laboratories with ten branches, employing 100 individuals. They furnish data and recommendations to design engineers engaged in the development of Ordnance Corps materiel. Their objective: to obtain the most efficient man-machine relationship.

The Laboratories staff, headed by Dr. John D. Weisz, a physiological psychologist and World War II veteran, includes 61 civilians, 11 officers and 28 enlisted soldiers. This staff includes a balanced group of electrical and mechanical engineers and psychologists, supported by industrial engineers, physiologists, physicists, biologists, chemists, electronic technicians, machinists, welders, and carpenters.

Facilities include a half-dozen buildings at the Proving Ground, consisting of converted World War II barracks, headquarters and a theater. Test facilities of the Ordnance Corps, other Army technical services, and those of the Navy and the Air Force are used in various studies.

The Supporting Research Laboratory is responsible for conducting broad generalized programs. A Systems Research Laboratory is responsible for detailed human factors engineering application on all Ordnance Corps-developed equipment. An Engineering Research Laboratory provides test facilities, equipment, and instrumentation to support the other two laboratories.

Test Problems

THE Laboratories are concerned with weapons of the present—how to improve them materially with the least possible cost; and weapons of the future—how to make them most easily operable by the average soldier.

Members of the Laboratories' staff are acutely aware that in time of general mobilization, the Army must make efficient soldiers of the men available. Equipment must be designed so that it can be operated and maintained under non-optimum conditions. The entire complex must be made as simple as possible because combat machines and equipment are only as effective as the men who must operate them.

The human factors engineer must reconcile the soldier's intelligence and capacity to learn with the design of the equipment to be used. He must also take into consideration physical

as well as psychological capacities.

Tests of the M-113 and the radar scopes offer, in miniature, an insight into the problems involved.

Many physical and psychological problems must be considered by Engineer Hicks in testing the M-113. In identifying the problems, understanding them, and solving them, he considers them in relation to the overall requirement: the "buttoned-up" M-113 must get the men to a location where they can close with the enemy in condition to perform their mission.

Nine major problems faced Hicks when he began his study. These included cramping, noise, vibration, temperature extremes, high humidity, toxic gases, motion sickness, sanitation, the ability of the driver to operate the vehicle in extreme temperatures—all affecting ability to fight after getting out of the vehicle.

Four representative infantryman's skills were selected as combat-relevant measures of performance—the ability to fire a rifle at a surprise target, the ability to lob a grenade at a fixed target, physical coordination and stamina required to complete an "obstructed run," and the ability to walk along a narrow rail. The latter was selected because balance is affected by cramping and loss of hearing due to excessive noise.

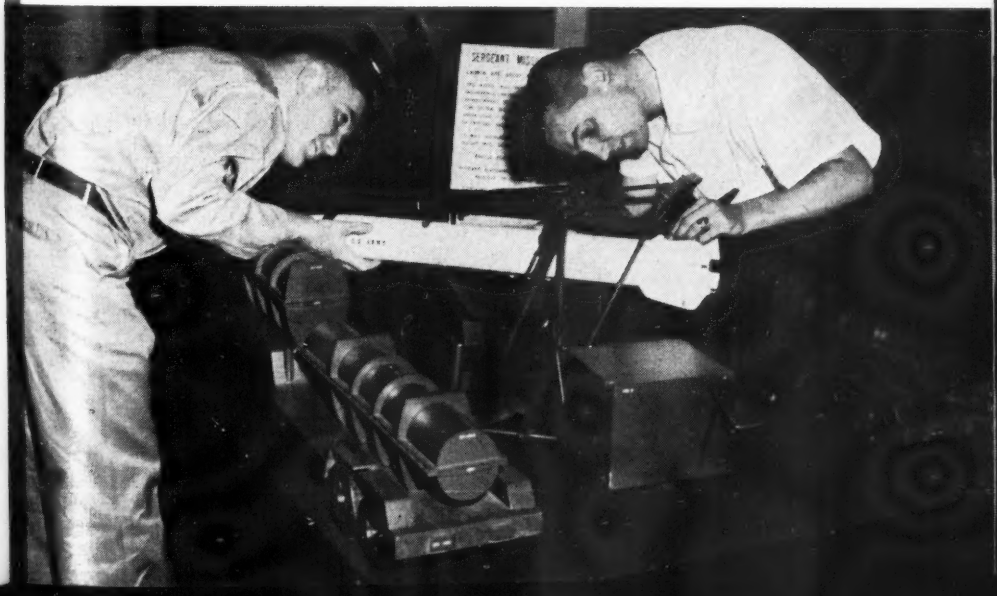
Sixty combat-trained, combat-ready soldiers from the crack 3d Armored Cavalry Regiment, a STRAC unit at nearby Fort George G. Meade, Maryland, became test subjects. They engaged in rifle firing at surprise targets, lobbing grenades at fixed targets, the obstructed run, and the rail walk.

Tests were administered before the subjects entered the carrier, to determine their normal proficiency. After spending four hours in the moving armored personnel carrier, they were quickly retested in the four basic skills.

The test series was repeated following rides of eight hours. Again the men were tested to compare their proficiency, before and after.

Hicks also was confronted with another human problem. Initial studies had to be "short term," with due precautions to avoid physical harm to the subjects. Loss of oxygen and increase of toxic gas content within the carrier must be carefully considered

Models of equipments, like this launch site of a Sergeant missile, often provide valuable information and savings over use of the actual expensive, bulky item.



before studies can proceed to 24-hour test periods.

To avoid possibility of error by subjects in reporting their sensations, a variety of instruments, including portable sound meters, air analyzers, and thermometers, were installed to "monitor" the carrier with special attention to problem areas.

Generally speaking, test results for four and eight hour periods indicate a decrease in combat proficiency after confinement. These findings are considered "statistically significant" and are being studied for their practical significance.

Changes and Innovations

INFORMATION obtained from studies of the M-113, and from earlier studies of the M-59 armored personnel carrier, has already resulted in certain design change recommendations.

These recommendations were based upon analysis of noises which interfered with voice communication, caused nausea and tinnitus (ringing head noises) in crew personnel. Although no permanent loss of hearing by a subject has ever been noted, recommendations were made for muffler changes, additional padding of loose items or equipment which could vibrate, and elimination of air-to-air contact from noise sources in the interior of the vehicle.

These changes resulted in a quieter interior that insures better hearing during the critical time of debarkation when troops must respond quickly to their leaders' orders.

The M-113 study is not aimed solely at improvement of one particular make or one model. As Dr. Leon T. Katchmar, Director of the Systems Research Laboratory points out, the Laboratories use equipment that is "currently available" for design studies of future combat vehicles. Thus the data obtained from present experiments, of great value today, will have many ramifications in other fields.

Problems of close confinement are applicable not only to armored personnel carriers; data also will be utilized in studies of other armored vehicles, including the main battle tank of the future.

Innovations being considered in

"IN THE area of personnel or human factors research, Army Research and Development effort is concerned with the most effective selection, classification, utilization, and assignment of our available manpower. We are developing tests which we hope will enable us to identify in advance the man who can and will fight best. This is essential if we are to raise the battle efficiency of our field forces to the highest possible level.

"We are also concerned with research for support of better military training and with engineering-psychological research to make man and the machine more compatible. As machines become more necessary in combat operations, we must resist the tendency to make them more complex to operate. It often occurs to me that we are in danger of outstripping ourselves in the technological field so that some day the machine may become the master of the soldier. We can never afford to let this happen—otherwise, we may well find our various machines useless on some future field of battle because man cannot cope with them."

Lieutenant General Arthur G. Trudeau,
Chief of Army Research and Development,
before the Walter Reed Army Medical Center,
Washington, D. C., 13 October 1960.

Concept of "tank of the future" is studied in model form by experts seeking continual improvement in design.

practical design of armored vehicles of the future include the possibility of placing the driver in a horizontal position. This should achieve a lower silhouette for the tank and greater comfort with resulting increased efficiency for the driver who may be confined to the vehicle for long hours.

Other problems confronting the human engineer include the use of electronic vision devices—television or infra-red, for example—for 24-hour operation, and an adequate display of necessary information for engine control.

Although many recommendations for changes in weapons and equipment of the future have resulted from studies of present-day weapons systems, it is the Laboratories' policy to recommend changes *before* production, based on studies of design drawings and using relatively inexpensive scale models. The staff is keenly aware of weapons systems costs and the limitations of the Army budget.

Readiness—Behind the Lines

THE so-called push-button warfare of today and tomorrow has abolished the "rear echelon." The advent of the missile able to deliver a nuclear warhead at ranges of thousands of miles has made the city in mid-continent as vulnerable as the front-line position of World War II or the Korean War.

An enlisted man or woman responsible for monitoring a radar scope could be responsible for the safety of the entire population of a major city. Loss of alertness by the operator could conceivably mean loss of a city from attack by an enemy bomber carrying a multi-megaton weapon.

Just as the soldier riding into battle in the armored personnel carrier can lose combat efficiency in a matter of hours due to fatigue, so can a radar

Fatigue due to noises was reduced in personnel carriers following intensive study of effects on the soldier.

Soldiers dash from a personnel carrier, then are tested on effect of being confined in closed areas for long periods.

operator at his console become slack in a matter of minutes due to fatigue resulting from strain and stress, or dullness and boredom.

This problem is under study at the Human Engineering Laboratories. Tests there indicate that a radar operator is fully vigilant for periods of only 15 to 30 minutes. After a half hour's duty, his loss of vigilance is so perceptible as to make him more of a liability than an asset in defensive operations.

In studying the entire problem of fatigue among radar operators, scientists literally "began at the beginning." First they looked at the overall problem of air defense operations.

The Army is responsible for the "point defense" of American cities, utilizing Nike-Ajax and Nike-Hercules missile units at fixed sites. In the event that a hostile plane manages to evade Air Force missiles and planes responsible for "area defense," this point defense automatically becomes an Army combat problem.

The Army has two means of seeing and identifying planes: the Army Missile Master's radars, and the radars of the on-site Nike units. Missile Master radars utilize four symbols for aircraft identification—friendly, hostile, unknown, and "tracked by another battery." Nike unit radars, linked as they are to the Missile Master, also employ the same symbols.

The first human engineering problem was to determine from large possible groups of symbols those which would result in the least amount of confusion to the operator. Soldier-subjects were shown combinations of many symbols and asked to select, for example, all of a certain design. Four were finally selected as being most quickly and accurately recognized.

Next came determination of size. The symbols had to be small enough so that they would not clutter the scope, yet they had to be large enough to be readily seen, and quickly and accurately identified. From these tests

Ability to fire a rifle at surprise target is one of skills tested in examining effects of close confinement in tank or carrier.

Other basic infantryman's skills tested as combat-relevant measures of performance include the ability to lob a grenade and walk along a narrow rail.

the Army adopted the best possible design and size.

Natural meanings associated with each symbol also were analyzed and taken into consideration to avoid the possibility of confusion under stress.

Even the best mechanical equipment in the world is useless if the soldier operating it is unable to employ it to fullest advantage. The problem of radar operator fatigue at fixed sites is further complicated by the use of radar and other electronic devices in mobile field weapons systems.

Fatigue can be alleviated, to a certain extent, by a system of orderly reliefs. In a field situation where the weapons system is mobile however, and under combat conditions, it may not always be possible to obtain such reliefs.

In its approach to the problem, the Laboratories are currently analyzing what can be done to design radar equipment so that the operator will be able to maintain a given level of alertness for a longer period of time, thus achieving maximum efficiency with the limited number of personnel available for this type of duty.

Benefits of Studies

TESTS of the M-113 and radar equipment are merely indicative of the many carried out by the Laboratories in their constant effort to mate the man with the machine more efficiently. Other studies range from the human engineering evaluation of the Pershing missile system to the motivational effects of rest periods on individual performance.

Just as many other programs and studies of the Ordnance Corps have had a certain amount of civilian "fallout," it can be expected that the Laboratories' studies will eventually have their effect on civilian production.

If studies by the Laboratories indicate, for example, that soldiers expect that a switch in the "up" position always signifies that power is "on," it can be expected that civilian manufacturers, taking a cue from the Laboratories' experience, will standardize their switches in the same manner.

Consider the possibilities inherent in adopting a supine position for the tank driver of the future. If this innovation "proves out," there is a not too remote likelihood that drivers of commercial vehicles might also use that position when required to remain at their wheels for long periods.

Similarly, the position of the driver's seat in an Army truck may some day have an effect on the design of the driver's seat in a civilian car. But all this is secondary, and a bonus by-product.

First and foremost, the Laboratories' main efforts are devoted to developing man-compatible combat equipment for the far-ranging, fast-moving soldier of today's and tomorrow's mobile, modern Army.

X-ray diagnosis moves to the field,
hand-carried in the new

Portable X-Ray Unit

PROMISING to provide an answer to a long-standing medical requirement, a compact diagnostic field X-ray unit newly developed by the Army Medical Service has the potential of furnishing, for the first time, a portable facility to take X-rays when electricity is not available, either in a combat zone or at a civilian disaster. Operating on rechargeable batteries, the unit works on the principle of portable photo flash units, with the X-ray tube having the role of the familiar visual strobe light of photographic equipment. The new unit weighs only 85 pounds and can be carried in a medium-sized suitcase.

An important feature is that it provides a diagnostic X-ray at such speed that it will not blur during chest radiography while a patient, who may be dazed or unconscious, normally is breathing. Further research is being conducted to enable operation off a standard military jeep battery as well as on its own power; and further weight reduction is being sought. To speed diagnosis, the Army Medical Service Research and Development Command also is attempting to find a more efficient method of film processing in the field.

The new techniques involved were made possible by a new vacuum tube developed for the unit by the Linfield Research Institute, a non-profit corporate subsidiary of Linfield College. McMinnville, Oregon.

NEWS of professional interest

Ordnance Operations

In a year-end summary of activities, Army Ordnance Corps notes that it is the largest of the Army Technical Services in terms of personnel, budget and active installations. During Fiscal Year 1961, the Corps will be responsible for obligating approximately $3 billion for research and development, procurement and production, training, maintenance, supply and other support activities.

In area and extent, the 81 active Ordnance Corps installations in United States occupy 1,600,000 acres—an area larger than the state of Delaware. These installations are criss-crossed by 12,400 miles of roads—equal to the entire road network of New Hampshire. Ordnance laboratories, warehouses, offices, shops, schools, depots and arsenal structures cover some 160,000,000 square feet of floor space—exceeding that of 100 Pentagons. Materiel in storage occupies 400,000 acres—about half the area of the state of Rhode Island.

Missile Master Network

With the recent dedication of a Missile Master center in the Los Angeles area, the Army completed its network of electronic centers designed to coordinate air defenses of key industrial and population centers within continental United States. Originally budgeted at a hundred million dollars, the design, development and installation phases of this complex system have been completed for ten million less than planned, according to Maj. Gen. R. T. Nelson, Chief Signal Officer. Centers now in operation are located in the Washington-Baltimore, Seattle, Boston, New York, Buffalo, Detroit, Pittsburgh, Philadelphia, Chicago and Los Angeles areas.

MOBIDIC to Seventh Army

MOBIDIC, the Army's first operational large-scale mobile digital computer recently placed on display in New York by Department of the Army, is scheduled to be sent to Seventh Army in Europe. Development of the unit marks a major move by the Army in its plan to automate many combat operations and combat support computations in fire support, surveillance, intelligence, logistics and administration.

Housed in a 30-foot trailer, MOBIDIC can move on the ground or be transported by air to support combat forces. Development of MOBIDIC and other members of the FIELDATA system—a family of compatible computers and communication devices to provide rapid data processing for a field army—is the responsibility of the Signal Corps. It was developed under technical direction of the Signal Research and Development Laboratory by Sylvania Electric Products, Inc., subsidiary of General Telephone and Electronics Corporation.

"Command Decisions"

A revised and enlarged edition of *Command Decisions*, containing twenty-three essays on the decisive actions of World War II participants ranging from field commanders to heads of state, has been published by the Office of the Chief of Military History. Authors are all professional military historians associated with the Department of the Army. Containing 565 pages with maps, chronology and index, the book is on sale for $4.50 from Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Radio Tube Performance

Emphasizing military contributions to progress in electronics, a radio equipped with tubes like those used in the first wireless telephone conversation from an Army airplane to the White House in November 1918, recently performed perfectly. Occasion was the presentation of

the radio by Western Electric Company as a historical memento to the Army Signal Corps. Called VT-1's (for vacuum tube number one) the antique bulbs reproduced voice and music as clearly as modern radio equipment.

"Army Blue Book"

Publication of *The Army Blue Book*—1961 is announced by Military Publishing Institute, Inc., of New York. Designed as an annual yearbook, it contains thirty-three articles by Army officials and civilian writers, supplemented by a tabulation of Army facts and statistics on organization, installations, weapons. One of a series devoted to each of the Armed Forces, the *Army Blue Book* sells for $1.50.

People-to-People—USAREUR

Among the community relations projects sponsored by United States Army, Europe during 1960 was an orientation tour for foreign university students. Some 24 students from 17 different countries attending the University of Heidelberg received first-hand knowledge of living conditions, training and equipment of the U.S. Army in Europe. They visited NATO Headquarters, Central Army Group, and traveled by helicopter to observe Army units at Grafenwohr and Fulda. The project is being used as a model for others along the same lines.

Improved "Trainfire" Mechanism

Improvement in equipment at a substantial saving in cost has ben worked into the Army's Trainfire system—the realistic "live" method of marksmanship practice which has reduced combat infantry rifle training time by half. Since it was first introduced two years ago, the system has been improved through engineering studies introduced at Rock Island Arsenal, an element of Army Ordnance Weapons Command. The result is a new model for the mechanically operated profile targets that appear unexpectedly, then disappear when a rifleman scores a hit.

In the new version, metal parts which formerly were welded are now stamped and electric power supply units are installed in weather-proof containers, thus increasing reliability and reducing maintenance. Ten thousand of the target holding mechanisms are being produced at a cost sharply below that of the initial system by Underwood Corporation at its Hartford, Connecticut, plant.

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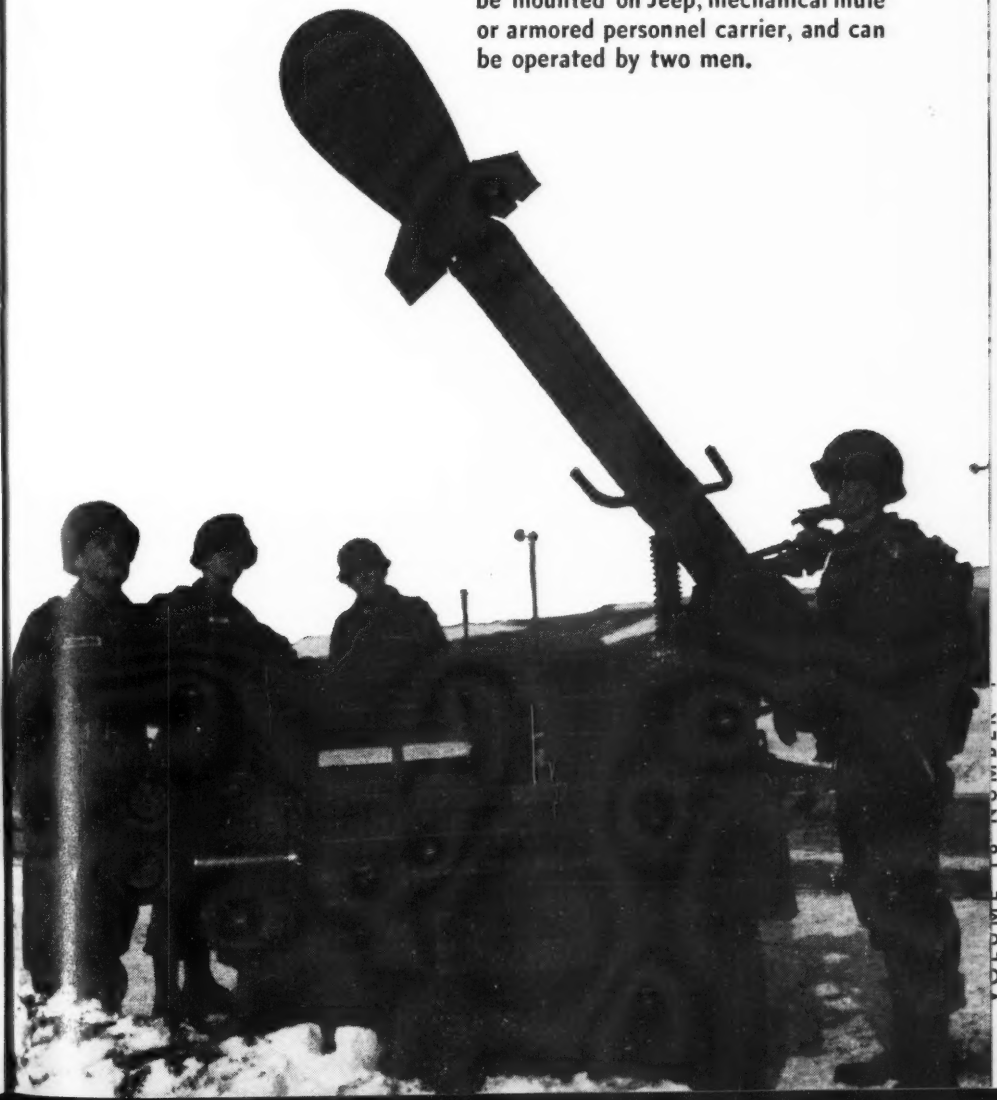
Davy Crockett Weapon System— Nuclear Capable, Portable, Man-Carried

THIS nuclear warhead for the Davy Crockett weapon system will give Armor and Infantry troops a low-yield nuclear capacity which dwarfs in firepower anything ever known in the immediate area of the battle line. Utilizing a new lightweight tube that also is capable of firing conventional warheads, the nuclear weapon packs tremendous force, yet has a small enough effective radius that nearby troops or civilian populations would not be endangered by blast. Radioactive fallout danger is minimized.

The U.S. Army Ordnance Corps has developed two launcher systems—a heavy and a light version, both of which have been tested with conventional warheads. Either version can be mounted on Jeep, mechanical mule or armored personnel carrier, and can be operated by two men.